The Relationship Between Literacy, Self-Efficacy and Behaviour Across the Early Years of School in New Zealand

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"Self-efficacy is not so much about learning to succeed as it is about learning how to persevere when one does not succeed" – Frank Pajares

Abstract

The correlation between self-efficacy, literacy and behaviour has the potential to have a long lasting impact on students' academic achievement, psychosocial development, and wider societal success. While each of these constructs have been investigated individually, and their interaction with each other researched, little research has looked at all three simultaneously, particularly within the first 3 years of students' formal education in Aotearoa New Zealand. The focus of the current research was to investigate the association between self-efficacy, literacy development, and behaviour in children from school entry through to their third year of school in Aotearoa New Zealand. Data from a longitudinal study (Chapman, Arrow, et al., 2018) was analysed which included reading self-efficacy, phonological processing, pseudoword reading, spelling, whole word reading, inattentive behaviour, hyperactive and moody uncooperative behaviour. Results indicated that inattentive behaviour was negatively associated with literacy across the first 3 years of school, while self-efficacy was positively correlated with literacy. Inattention at the end of Year 1 was positively correlated with self-efficacy in the third year of school. Inattention was the most highly correlated behaviour variable with self-efficacy and literacy, above hyperactivity and moody uncooperative behaviour. Overall, the results suggest that low literacy achievement early in school may contribute to low self-efficacy and high levels of inattentive behaviour, all of which have a negative impact on literacy achievement throughout the school years.

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Chapter 1: Introduction

One of the primary objectives of the early years of schooling is to develop literacy skills, including reading and writing skills. The development of literacy skills is positively associated with academic achievement, positive psychosocial development, and participation in wider society (Lyon, 1998; Tunmer & Chapman, 2015). Children tend to not learn to read naturally through immersion in a literacy rich environment; reading is a skill that must be intentionally taught (Arrow et al., 2015). Aotearoa New Zealand has one of the largest disparities between high and low literacy achievers, which has persisted over time (Elley, 1992; Tunmer et al., 2013) and is often referred to as the long tail of under achievement. Evidence suggests that differences in literacy ability exist from school entry which means students may be behind in learning before teaching begins (Arrow, 2010). Children who experience difficulties in learning to read early in school are at risk for literacy difficulties, which tend to increase in severity throughout school years; this phenomenon is known as the Matthew effect (Stanovich, 1986). The Matthew effect has the potential to create a cycle of low educational achievement, as literacy difficulties influence students' ability to engage within the wider school curriculum (Nathan & Stanovich, 1991). As such, it is fundamental to address literacy difficulties early and effectively (Tunmer & Chapman, 2015).

Children who have difficulty developing literacy skills may also struggle to develop positive self-perceptions, in particular self-efficacy. Self-efficacy is a person's judgement of their ability to succeed at a particular task (Everatt & Denston, 2018). Having high self-efficacy has been linked to better academic outcomes (Lee & Jonson-Reid, 2016; Multon et al., 1991; Schunk, 1981). Those with high self-efficacy who perceive their ability to succeed to be high, are more likely to engage in the task, and show motivation and persistence which make success more likely (Linnenbrink & Pintrich, 2003). The research around self-efficacy came out of the work of Bandura (1997) who introduced the idea that cognitive processes

mediate behaviour. A person's judgement of their ability will inform how they behave and thus influence the outcomes they experience.

Academic achievement has also been linked to classroom behaviour (Prochnow et al., 2013). Chapman and Tunmer (2003), for example, found that those with low self-efficacy are more likely to give up quickly and engage in off task or avoidant behaviours. This has important implications in the educational context as the behaviours students engage in may then influence academic outcomes. In fact, behaviour, particularly inattentive behaviour, has been linked to low literacy achievement (Sims & Lonigan, 2013; Velting & Whitehurst, 1997). The relationship between behaviour and self-efficacy has also been investigated. Multon et al. (1991) found that classroom behaviour was a significant predictor of reading achievement but was not associated with self-efficacy. However, Bandura et al. (1996) suggests a different relationship, with the finding that behaviour mediates the relationship between self-efficacy and academic achievement.

The current research included a secondary analysis using data from The Early Literacy Project (Chapman, Arrow, et al., 2018). The Early Literacy Project was a longitudinal study following learners' literacy progress from school entry in February 2015 through to their third year of school in July 2017. Specifically, it investigated the effect of increasing teachers' knowledge of code-based instruction over meaning-based with early readers with fewer basic reading skills. Results from the first year of the study (2015) with failed to identify any significant statistical differences in literacy scores between the intervention and control group following the intervention. As there were no significant differences between literacy scores found between intervention and control groups in this cohort, the two groups have been treated as one and analysed together for the purposes of this research.

Rationale

Self-efficacy and behaviour each have the potential to have a long lasting impact on students' literacy development and wider academic achievement. While each of these constructs have been investigated individually and, their interaction with each other researched, little research has looked at all three simultaneously. In addition, there is little research with children in the first 3 years at school. This is of particular interest as literacy gaps early in school tend to persist or widen over time. Thus, finding relationships between self-efficacy, literacy, and behaviour in this time frame would suggest that these differences should be addressed early to facilitate the most positive outcomes for students. The current research aims to understand the interaction between levels of self-efficacy, literacy development, and classroom behaviour in children beginning school through to their third year of school in Aotearoa New Zealand.

Overview of Thesis

The thesis is comprised of 5 chapters. Chapter 2 provides an overview of the current literature around the development of literacy skills and the potential association between self-efficacy, behaviour, and literacy development. Research regarding behaviour and its impact on classroom learning will also be explored. Chapter 3 includes an explanation of the methodology used to conduct the study. The results are then reported in Chapter 4, including correlations between literacy, self-efficacy, and behaviour, as well as the effect of self-efficacy levels at the end of Year 1 on literacy development over 3 years at school. Chapter 5 discusses the main findings of this study and identifies the implications for teachers in practice and future research.

Chapter 2: Literature Review

Reading

Literacy skills, including reading and writing, are essential to support engagement in wider academic learning, positive psychosocial development, and societal participation in later life (Chapman, 1988; Stanovich, 1986). The skills and processes that underpin learning to read are the focus of a large amount of literature. Reading is not a natural phase of human development like learning to walk or speak, rather it is an intentionally learnt skill made up of multiple foundational skills (Cabell et al., 2008). Emergent literacy skills are the foundations of reading at a basic level, developing towards proficiency. Learning to read is often described as a phase-based process where literacy skills develop and build on each other as students can read increasingly complex pieces (Chall, 1976; Ehri, 2005). Some children develop literacy skills easily, while others struggle (Liberman & Liberman, 1992). Children with higher developed emergent literacy skills tend to develop literacy skills more easily than children who have lower levels of emergent literacy skills (Prochnow et al., 2015).

Emergent Literacy

In order to learn to read, children need a set of foundational abilities which are known as emergent literacy skills. These written and oral abilities are developed by children throughout the years prior to learning to read which forms the foundation for formal reading instruction (Whitehurst & Lonigan, 1998). Emergent literacy skills are identified by Cabell et al. (2008) as including phonological awareness, print awareness, alphabetic knowledge, emergent writing, and oral language which includes inferential language and vocabulary.

Prior to being able to decode words, children must develop the alphabetic principle (Pikulski & Chard, 2005). The alphabetic principle describes the understanding that letters relate to sounds that make up spoken words (Cabell et al., 2008). It is an indicator that

children are moving from emergent to beginner readers. In order for children to be able to grasp the alphabetic principle, they typically begin by engaging in emergent literacy behaviours like pretending to read or using symbols to glean meaning, demonstrating they understand that the writing on a page or sign explains something about the world e.g., a stop sign means that the cars must stop, or a certain 'M' denotes the fast-food chain McDonalds (Ehri, 2005). The line between developing emergent literacy and beginning to learn to read is blurred. However, once children have moved from decoding words logographically, such as guessing words through a known cue like a symbol or picture, to decoding phonetically, that is using letters to form sounds without the use of known cues, children may typically be described as beginning readers (Cabell et al., 2008). It is critical that emergent literacy skills are developed effectively and gaps in knowledge are identified and taught, as children who tend to come to school with fewer emergent literacy skills tend to take longer to learn how to read (Arrow & McLachlan, 2014; Cabell et al., 2008).

Literacy

Reading is the process through which meaning is derived from written text (Tunmer & Hoover, 2014). How children learn to read and the best method of teaching reading has been the subject of heated debate for decades (Castles et al., 2018). Some theorists argue that children are predisposed to be able to learn to read and the process occurs organically (Goodman, 1967). This is known as a whole language approach or "top down", where meaning is emphasised and literacy develops through interacting with language contextually in the environment (Castles et al., 2018). In contrast, other theorists believe that reading develops from the "bottom up" through decoding and the use of word level skills. This led to the 'reading wars' where theorists debated top down verses bottom up approaches to learning to read (Castles et al., 2018). The Simple View of Reading (SVR) model was proposed in response to the 'reading wars'(Gough & Tunmer, 1986). Gough and Tunmer (1986), in their

SVR model, define reading comprehension as the ability to derive meaning from text, which is comprised of two main elements that include decoding and language comprehension. They ascertained that reading comprehension (R) is the combination of two underlying skills: the ability to decode (D) and the comprehension of spoken language (C) or R = D x C (Tunmer & Hoover, 2014).

Gough and Tunmer (1986) originally referred to decoding as the ability to recognise words which was later referred to as word recognition. The difference between decoding and word recognition is that word recognition may be achieved by multiple means including memorisation, cues from the environment, or by decoding. Word recognition includes the ability to quickly recall previously decoded words that have been commited to lexical memory. Word recognition does not always require decoding. Decoding is the skill of using the alphabetic principle to decode and read a word. Decoding refers exclusively to the reading of novel words quickly and accurately regardless of previous exposure to the word (Gough & Tunmer, 1986).

The second skill in the SVR model is language comprehension where children convert sounds into words with meaning for the purpose of understanding the wider written text (Tunmer & Hoover, 2014). This could be described as the ability of children to understand words when they are spoken aloud. This requires wider knowledge of language and an understanding of what an individual word means in order to comprehend a collection of words. Both the ability to decode the words and the ability to understand the words once decoded are needed for the child to derive meaning from the words on the page; neither are sufficient on their own (Tunmer & Hoover, 2014).

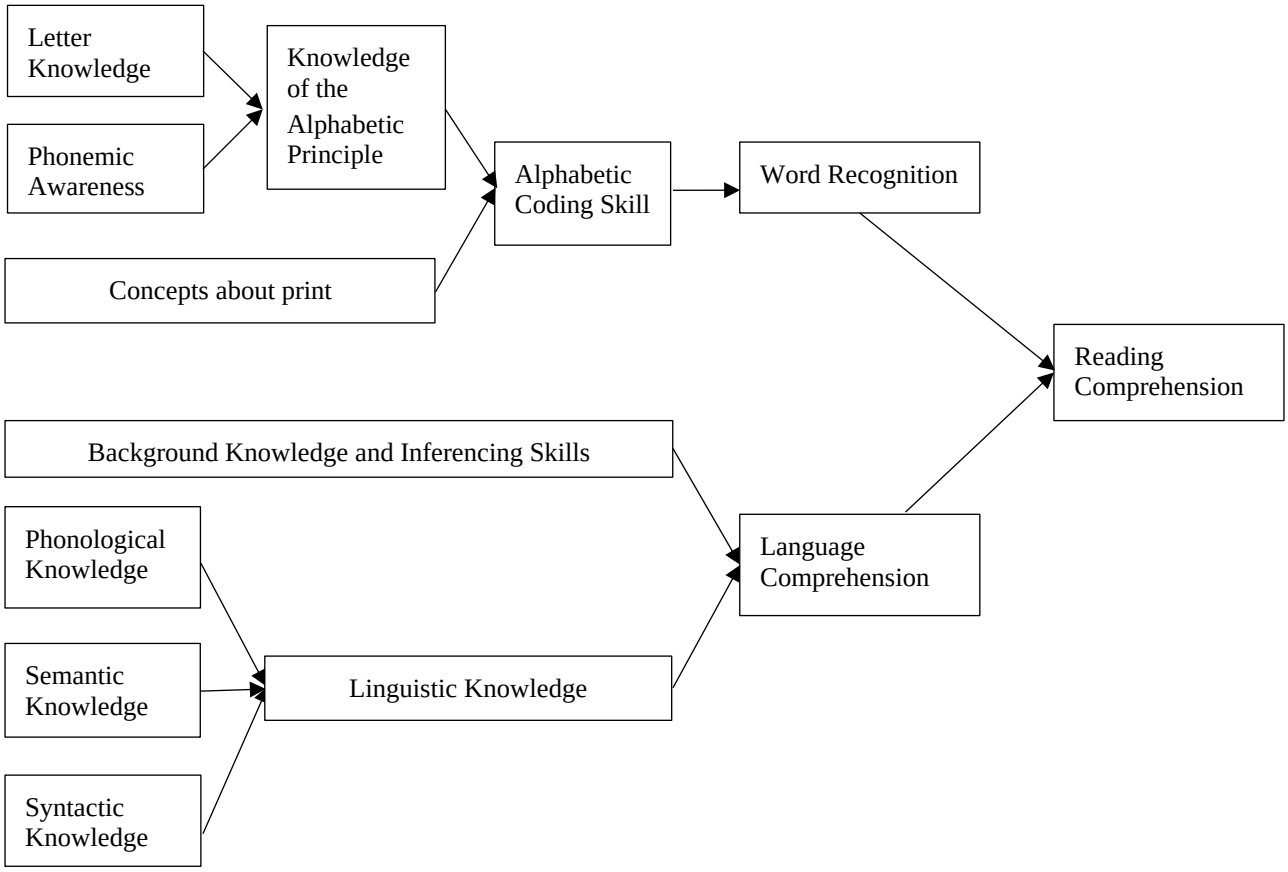
The SVR is a static model, as it describes reading at a single point in time and states that at any point in time the level of reading comprehension is dependent on the level of word recognition and language comprehension (Hoover & Tunmer, 2018). However, it does not

explain the skills which underly decoding and language comprehension and how these skills develop (Tunmer & Hoover, 2014). The cognitive foundations model framework extends upon the SVR model, in that it describes reading comprehension as being made up of language comprehension and word recognition (Hoover & Tunmer, 2018), along with the foundational skills that underpin decoding and reading comprehension. The cognitive foundations model uses the phrase word recognition rather than decoding which is used in the SVR, however, these are describing the same thing, because it includes both learning to, and being able to, read words with fluency and automaticity.

The cogntive foundations model describes reading comprehension as the subject of language comprehension and word recongition, as shown in Figure 1. For the development of word recognition, children must have gained knowledge of the alphabetic coding skill (Tunmer & Hoover, 2014). This is the ability to combine the alphabetic principle, which is the link between print and speech through letter-sound relationships, with concepts about print. Knowledge of the alphabetic principle is underpinned by letter knowledge which is the ability to recognise and manipulate letters of the alphabet. This is mostly done though learning letter names which often correspond to their sounds (phonemes). This develops alongside phonemic awareness which is the ability to manipulate the phonemic elements of spoken language and separate out sounds in words to identify the first, middle, and end sound (phoneme) of words (Tunmer & Hoover, 2014).

Figure 1

The Cognitive Foundations Model (Tunmer & Hoover, 2019)



Word recognition and the skills that underpin it develop alongside the skills that are foundational to language comprehension. Language comprehension is built on background knowledge and inferencing skills, namely the ability to draw on relevant previous knowledge and combine current information with previous knowledge to infer meaning from the text. This skill is combined with linguistic knowledge, which is made up of phonological, semantic, and syntactic knowledge. Knowledge of phonemes is the ability to differentiate between different sounds in spoken words. Semantic knowledge is understanding the meaning of words. Syntactic knowledge describes the structure and rules that govern how a sentence is constructed. Background knowledge and inferencing skill has an important cultural component as a child's cultural experiences before school can affect understanding of culture-based language and the background knowledge needed to understand the whole

text (Tunmer & Hoover, 2014). For example, a child who has grown up in the United States of America will be less likely to accurately read and comprehend a story about rugby as they may not have the same level of background knowledge as a child from Aotearoa New Zealand. Children who possess the relevent background knowledge will find comprehension much easier than children who are trying to remember each sentence and the information it contains without the relevant background knowledge (Tunmer & Hoover, 2014).

Developmental Models of Learning to Read

The cognitive foundations model is preceded by earlier developmental models of learning to read that have been formulated by theorists for many years. Chall (1976) describes five stages of learning to read from birth through to adulthood, of which the first two phases detailed are decoding and fluency (Chall, 1976). The first phase of Chall (1976) is the decoding phase which describes the process of decoding occurring initially through memory and contextual guessing, and later through processing letters and sounds. Readers then progress to fluency in the second phase. Frith (1985) expanded on this with a three-phase theory. In Frith's model, children learn important basic reading concepts in phases. The first phase is the logographic phase where distinctive visual cues or contextual features of a word allow them to read certain words. This is due to committing arbitrary links to memory rather than through knowledge of letter-sound relationships. Once it becomes too confusing and difficult to learn new words by arbitrary link and rote learning, the reader moves to the second phase. In this, the alphabetic phase, readers learn to use spelling-sound relationships to decode words. Learning the relationships between graphemes (letters) and phonemes (sounds) helps readers sound out each word. The last phase, the orthographic phase, then develops. In this phase, words are read through morphemic units which usually use larger spelling patterns. Chunks of smaller known words and spelling patterns are used to decode more complicated unknown words.

Encompassing the work of previous theorists, Ehri (2005) developed a theory which detailed four phases through which beginner readers move to be competent readers. The first phase is the pre-alphabetic phase. Pre-alphabetic readers rely on context cues such as logos or shapes, making arbitrary connections between spelling and pronunciation to help begin to read words (Ehri, 2014). At this point, there is no knowledge of the connection between letters and sounds. Once readers begin to develop letter knowledge and can form partial connections between letters and sounds, similar to that described in Frith (1985), they move to the partial alphabetic phase. Partial alphabetics are beginning to learn the connection between graphemes and phonemes, however this knowledge is incomplete. They are likely to use the first letter of the word and the context cues to predict a word or pick up particularly salient letters and their sounds, but not every single grapheme-phoneme relationship. Full alphabetic phase is achieved when readers have knowledge of the connections between graphemes and phonemes and can decode new words and commit to memory words which have been read multiple times. They can read words by sight and read whole words rather than each individual sound. They can separate out all the sounds in a word and write a phonetically sound spelling of new words. In the last phase, known as the consolidated alphabetic phase, much like in the orthographic phase of Frith (1985), children are able to remember parts of words and how they relate to blended sounds such as ‘ion’ and ‘ing’. This helps in decoding multisyllabic words as readers are more likely to know the broken-down chunks of words rather than having to sound out each sound. As knowledge of spelling develops, their memory of spelling to sound relationship develops, and their ability to read more complex words grows. Developmental reading theories typically imply that mastery of a previous stage is required before progressing to the next stage, however, Ehri’s phases are less rigid and allow for overlap between each described phase, and the skill that develops within that phase (Ehri, 2005).

The developmental phases within Ehri (2014) describe the pathway learners progress though as they learn full orthographic mapping for accurate word reading. Orthographic mapping occurs when a reader forms the connection between the written form of graphemes such as ‘b’, and the spoken form of phonemes, such as ‘*bee’* for the name of the letter. This develops into learning more complex connections such as ‘th’ and larger chunks of written words like ‘ion’ which correspond to spoken syllables, or morphemes. When these connections are contained in lexical memory with the meaning of the word, the reader can read and understand the word on sight should they encounter it again. This process of committing increasingly complex words into lexical memory is the development of a large vocabulary of sight words. Sight words can be called on in the future with minimal cognitive effort and can be used to decode more complicated letter sound patterns (Tunmer & Hoover, 2014).

Share (1995) has a similar developmental theory as the previous theorists (Chall, 1976; Chall et al., 1990; Ehri, 2005, 2014; Frith, 1985). Share (1995) describes children beginning to learn to read by committing a limited number of words to memory through an arbitrary link without understanding the relationship between spoken and written words. These words are recognisable on sight but do not represent phonological decoding. Readers that use this method are more likely to guess words based on context. This strategy is effective in regards to learning the alphabet to help acquire word recognition, but not as an ongoing reading strategy, as memorising the amount of words required to read effectively could be likened to memorising a telephone book or dictionary. Once this contextual guessing is no longer sufficient, children then progress to phonological decoding. After successfully decoding a word, the links it contains are committed to lexical memory and can then be used in the future to decode more complex words. Thus, children have the ability to self-teach new words as they are exposed to increasingly more complex text.

The difficulty is not all children naturally switch to phonological decoding once it is too hard to rote memorise all the words they need to know (Chapman & Tunmer, 2003). Often, they first must be explicitly taught the alphabetic principle or they will continue to rely on rote memorisation, which is an ineffective and draining strategy that can be detrimental to their learning (Chapman & Tunmer, 2003; Tunmer & Hoover, 2014). Children need to develop basic knowledge of letter-sound relationship and phonemic awareness alongside the ability to use contextual information in order to develop literacy abilities (Share, 1995). As these skills develop, the self-teaching strategy of Share (1995) comes into effect. Once the child can associate print with sound and begin to decode new words on their own, they are more likely to engage in independent reading. Reading independently will expose them to new words to decode, which after repeated decoding will be added to lexical memory, thereby broadening their vocabulary and allowing them to spend mental energy decoding new more complex words, thus allowing them to read increasingly complex text. This is known as moving out of the 'learn to read' phase and into the 'read to learn' phase (Stanovich, 1986). Continual development of vocabulary occurs independently as children read and decode more words on their own.

For Share's self-teaching strategy to be effective, children need to be reading appropriately for their reading level. This means reading text with only a small number of novel words. This allows them to read most items quickly and without much effort, with only the novel words requiring more effort to phonologically decode (Share, 1995). Too many novel words and children may become tired and frustrated, believing that the task is too hard which may lead to doubt in their own ability. Too few novel words and readers may become bored as the text is not challenging. Neither scenario will result in the optimal level of learning.

Reading Difficulties

Difficulties in developing word recogniton and decoding occur when children do not progress from emergent literacy to decoding, eventually developing the ability to read fluently. If children are able to develop the relevent literacy skills with ease, they will soon be able to decode competently, thus developing the ability to read independently. This means that children are then able to practice and improve their skills, developing their reading ability independently through reading increasingly complicated texts (Share, 1995). A typically developing child moves out of the halting and slow 'learn to read' phase of learning and is able to 'read to learn' (Share, 1995). There is a risk that children who struggle and stall at any point may fall further and further behind and become subject to the Matthew effect (Stanovich, 1986).

The Matthew effect is a negative spiral experienced by children who are having difficulties in developing literacy skills. Unsuccessful experiences can lead to avoidance of reading, increased inattentive behaviours, and withdrawal from literacy learning tasks, which reduces the amount of reading practice they engage in (Prochnow et al., 2013). This decreased opportunity for practice can have a continued negative impact on reading and literacy achievement (Nathan & Stanovich, 1991). Low literacy achievement can have subsequent negative spinoff effects later to more general achievement, extending beyond literacy to influence other areas, such as engagement in learning and motivation (Peura et al., 2019; Stanovich, 1986).

Children who start school with fewer emergent literacy skills are more likely to experience difficulties in developing reading skills (Prochnow et al., 2015). Children who, at school entry, possess more emergent literacy skills such as developed oral language and basic knowledge of literacy, such as understanding that words in books tell a story, are able to learn to read more easily (Prochnow et al., 2015). These skills develop through exposure and

engagement with literacy in the home environment such as book reading, talking about a book, and verbal exchanges with adults. Research has found that children who come from more disadvantaged backgrounds, including lower income families with low socio-economic status, have lower levels of emergent literacy skills when starting school (Tunmer & Chapman, 2006). This may be because of financial pressure, single parent homes, large families, and less available resources, all of which make it difficult for children to learn these literacy related skills prior to school entry (Korat et al., 2007). Those with low emergent literacy skills are more likely to become subject to a negative Matthew effect, where they have more difficulty in learning and progress more slowly, while those who started with higher skill levels progress faster (Prochnow et al., 2001).

One reason why children with low emergent literacy continue to struggle may be due to the fact that they tend to use different strategies to decode words compared to those with higher levels of emergent literacy. Children with low emergent literacy skills tend to rely on ineffective strategies to decode words, such as using the accompanying illustrations to guess an unknown word, or using the sentence context to select a word that satisfies the semantic and syntactic contraints of a sentence (Tunmer & Chapman, 2002; Tunmer & Hoover, 2014). These are known as text-based strategies, and they are less effective and likely to result in errors as the amount of words that fit the sentence context and the illustration make selecting the right word a guessing game with variable success rates. However, those with higher levels of emergent literacy skills tend to use word-based strategies including letter-sound relationships and using knowledge of words to decode the new words (Tunmer & Chapman, 2002). These students tended to have more success in later reading than those children who used text-based strategies (Connor et al., 2004). In addition, children who used word-based strategies also had improved reading related self-perceptions, including higher self-efficacy (Tunmer & Chapman, 2002).

Children who use ineffective text-based strategies may benefit from explicit word-based teaching (Connor et al., 2004). Word-based teaching is the direct and explicit teaching of the correspondences between letters and sounds (Tunmer & Hoover, 2014). Connor et al. (2004) found that children who held low levels of reading related skills, benefitted more from teacher-managed word-based instruction. However, children who had higher levels of reading related skills benefitted from less teacher-managed word-based instruction and more independent time reading books and writing. This was likely because these children had already developed effective word-based reading strategies that enabled them to read independently while the children with low levels of reading related skills had not yet learned these strategies and needed more direct word-based instruction develop these skills.

Word-based teaching can be helpful outside the context of written text because this takes away the other contextual cues a child may have learnt to rely on and allows them to fully focus on practicing word-based strategies (Tunmer & Hoover, 2014). Children should be able to use word-based skills to create an approximate pronunciation of a new word. This approximate pronunciation can then be tested against their lexical memory to identify the correct pronunciation and word meaning. The opportunity to practice this skill and receive feedback is important as it will prevent a child slipping back into ineffective previously used methods of reading (Tunmer & Hoover, 2014).

Children benefit from different types of literacy instruction depending on the level of emergent literacy at school entry. This teaching that is tailored to a student's specific needs is known as differentiated instruction (Arrow et al., 2015). Teachers need to be equipped to deliver explicit teaching instruction based on a learner's needs. This requires teachers to have a high level of understanding of phonology, orthography, morphology, literacy acquisition, and instructional strategies in order for teaching to be effective (Arrow et al., 2015). This is important as children with high levels of emergent literacy skills likely acquire word-based

strategies and learn to read regardless of teaching method, while those who come to school with lower levels of emergent literacy skills require explicit word-based teaching to develop word-based decoding (Connor et al., 2004). Those with lower levels of emergent literacy skills and who are taught using text-based instruction tend to use text-based strategies which can become entrenched and hard to unlearn (Connor et al., 2004; Tunmer & Hoover, 2014). Additionally, there is greater potential for growth for those who were low achieving at school entry if they are taught with emphasis on word-based skill than for high achievers (Connor et al., 2004). It could be suggested that this difference in acceleration reflects that undifferentiated teaching naturally favours those with more literacy skills at school entry, those that typically acquire reading easily with minimal direct instruction, over those that need more explicit teaching to achieve similarly.

In Aotearoa New Zealand, reading is commonly taught from a whole language approach, using text-based strategies (Arrow et al., 2015). The whole-language approach has emphasised teaching children to decode unfamiliar words by relying on meaning (based on the picture), structure, and the first letter of a new word with word level decoding often used as the final option (Chapman, Arrow, et al., 2018; Clay, 2005; Goodman, 1967). This approach is known as the multiple cues approach, which does not support the development of word-level strategies. This is problematic because children with low literacy skills at school entry will have difficulty developing effective decoding strategies as teaching emphasises text-based strategies. It may be that this plays a part in the Matthew effect being particularly prevalent in Aotearoa New Zealand as our teaching system has not been structured to support children who need more explicit instruction in learning how to learn to read (Tunmer & Chapman, 2015).

Self-Efficacy

Self-efficacy is a person's self-perception of their ability to succeed or fail at a particular task (Everatt & Denston, 2018). A person is more likely to engage in a task in which they have high self-efficacy and when they feel confident they can complete the task successfully. Low self-efficacy, on the other hand, may lead to lower engagement or avoidance of the task as failure is expected. Self-efficacy has important implications in terms of literacy development which requires sustained attention and practice. Often, those that struggle with literacy have not yet developed the skills necessary to read as they are expected to, and are thus more likely to avoid reading, which leads to lower reading achievement (Share, 1995). These students who struggle to develop literacy skills may also have low self-efficacy (Liew et al., 2008).

The study of self-efficacy emerged from the work of Bandura (1997), who argued that human behaviour was affected by cognitive processes (Bandura, 1977). Before this, behaviour was largely thought to be informed solely by the reward or consequences of an action, increasing or decreasing said behaviour accordingly (Skinner, 1938; Thorndike, 1898). Bandura suggested that cognitive processes mediated behaviour by influencing a person's level and strength of self-efficacy (Bandura, 1977). Self-efficacy will then inform behaviour (Everatt & Denston, 2018). As such a child who thinks they can successfully read a book, will put in more effort and persist longer than someone who doesn't believe they have the ability to succeed. Self-efficacy is drawn from four main sources: mastery, vicarious experiences, verbal persuasion and physiological states, to inform belief about one's own capability to succeed at a similar task in the future (Bandura, 1977). This integration of different information influences behaviour and the effort and persistence applied in each circumstance (Bandura, 1977).

Firstly, and most effectively, self-efficacy is described by Bandura (1977) to be developed through experiences of mastery and, in particular, whether a person succeeds or fails in a certain area (Everatt & Denston, 2020). A person uses success as evidence of their ability to succeed in similar situations, which positively influences the development of self-efficacy. Failure provides evidence of a lack of ability and will negatively inform the perceptions about the ability of the person to perform in similar situations in the future, negatively influencing the development of self-efficacy. However, when a task is difficult and persistence yields success, this leads to the development of resilient self-efficacy, which not only encourages persistence in similar difficult tasks in the future but may transfer across tasks (Bandura, 1997). Secondly, self-efficacy can be influenced through vicarious experiences, including watching others succeed or fail. Watching a peer succeed at a task may positively influence self-efficacy, while failure may have the opposite effect. The extent to which vicarious experiences affect the development of self-efficacy is dependent on whether the person is someone you judge to be quite similar to yourself. Thirdly, the development of self-efficacy can occur through verbal persuasion. This is when feedback on a person's performance informs self-efficacy, albeit depending on the extent to which you believe the feedback is true and realistic. Positive feedback nurtures self-efficacy, while negative feedback may have a negative influence. However, if verbal persuasion is unrealistic, it is not effective and has a negative effect on both self-efficacy levels and the credibility of the person giving the feedback (Denston, 2016). Finally, a person's physiological reaction about a situation also influences self-efficacy. A positive emotional response is likely to increase self-efficacy, while a negative response may have a similarly negative effect on self-efficacy development. The extent to which these factors affect self-efficacy depends on how relevant the person believes the experience is to themselves, and whether self-efficacy has already been developed in that area. As self-efficacy beliefs inform

behaviour as they develop, the relationship between self-efficacy and behaviour is likely to be reciprocal (Denston, 2016).

Within literature, self-efficacy has often been treated as synonymous with self-esteem, however, it is important to note distinctions between the two terms. Self-efficacy is developed through cognition, which is what a person thinks about their ability to succeed. In contrast, self-esteem is developed through emotion and refers more generally to how a person feels about themselves as a whole (Everatt & Denston, 2020; Morris et al., 1990). According to Bandura (1997), a person is more likely to engage in activities that will increase their self-esteem. Self-concept is a subdomain of self-esteem, referring to a person's self-esteem in a particular area such as academic performance or ability such as reading and writing. Self-esteem and self-efficacy are associated (Everatt & Denston, 2020). The association between self-esteem and self-efficacy is observed to be stronger when an individual places value on an activity (Everatt & Denston, 2020). However, an individual can have high self-efficacy or low self-efficacy during an activity without experiencing any increased valuation or devaluation in their self-esteem, although this is dependent upon how much value they place on an activity. Self-efficacy levels are more malleable than self-esteem, and can vary over time and between tasks, independent of self-esteem (Denston, 2016).

There is debate in the literature around whether self-efficacy can be measured in young children. This is because there is some question as to whether young children can make judgements of their own capabilities that differ depending on the construct or subject being assessed (Davis-Kean et al., 2008; Webster-Stratton & Lindsay, 1999). While self-efficacy in young children is less widely researched than older children and young adults, there is some evidence that it can be measured in younger children. Lee and Jonson-Reid (2016) conducted a study on self-efficacy in relation to achievement with children in first through to third grade. They found variation between reading self-efficacy scores and reading

self-concept scores and concluded that students in these early grades were able to differentiate between these concepts. In addition, they found reading self-efficacy had a significant positive effect on reading scores. Wilson and Trainin (2007) conducted a study on motivation for reading, writing, and spelling in first-grade students. They found that self-efficacy was correlated with reading and writing measures, and that first-grade students were able to differentiate between their self-efficacy in multiple domains, including reading, writing, and spelling. These findings suggest that young children can differentiate between different subdomains of self-efficacy. This would suggest that young children are able to accurately judge and report their own self-efficacy. Notably, the presence of an association between self-efficacy and reading scores in first-grade students suggests self-efficacy can be related to achievement very early in the school years. The potential impact of self-efficacy levels on literacy or vice versa may be greater as it begins within the first year and may continue throughout school.

Self-Efficacy and Academic Achievement

Self-efficacy levels affect learning through influencing the types of behaviours students engage in and the amount of effort put into learning, thus self-efficacy may be particularly relevant in fields that require extended attention and focus such as reading. Bandura (1997) argued that self-efficacy was both the product and the construct of experience, which is particularly notable in the setting of education. Peura et al. (2019) found that self-efficacy beliefs were related to effort, motivation, and persistence. Similarly, Burden and Burdett (2005) found that students are likely to put in effort and show motivation and persistence in accordance with their expectations and belief about their ability to succeed, thus in accordance with their self-efficacy. Therefore, self-efficacy may be particularly important for learning that requires sustained effort and independent practice (Peura et al., 2019). Those with high self-efficacy are more likely to engage in these tasks, applying effort,

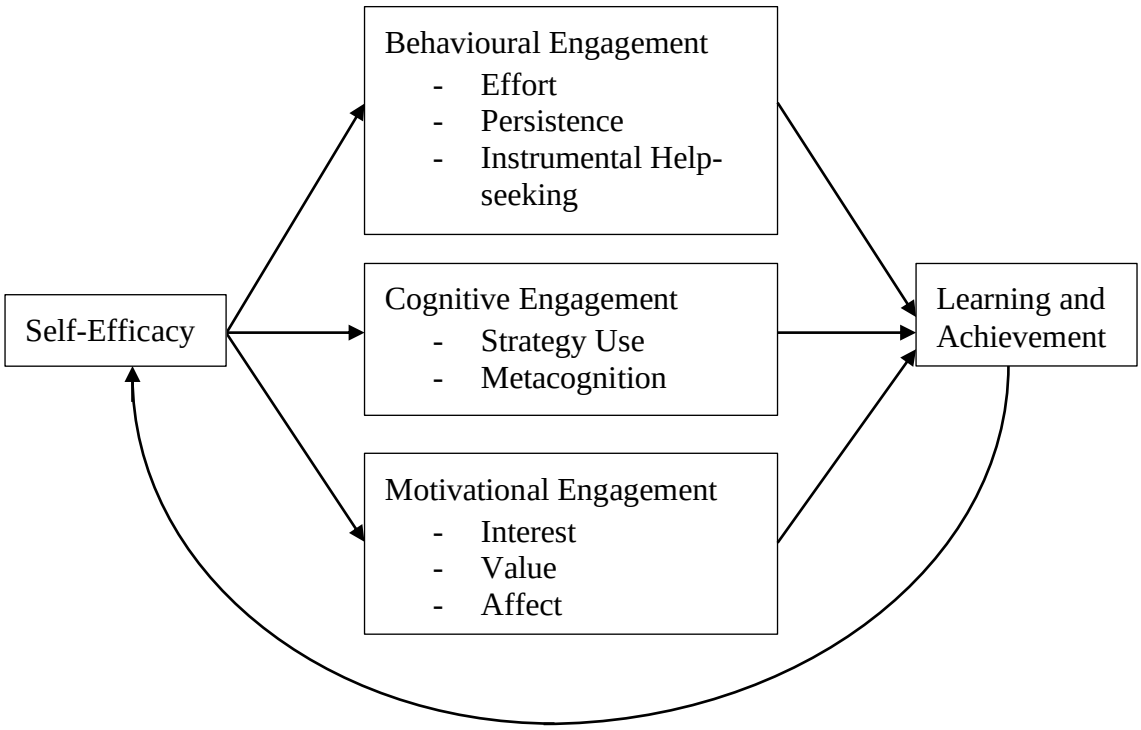
motivation, and persistence, while those with low self-efficacy are less inclined to do so. This may mean that a child with high self-efficacy who persists longer and engages with reading is likely to succeed and thus develop their reading skills more than their peers with similar ability but low self-efficacy.

A child with low self-efficacy, and therefore low expectations, is more likely to give up faster and experience failure, which serves to reinforce their perceptions of their capabilities (Bandura et al., 1996). In contrast, a child with high self-efficacy and high expectations who believes that they can succeed, will be more likely to persevere in a difficult task until they achieve success (Pajares & Schunk, 2001). However, perseverance through difficult circumstances is important in developing what Bandura (1997) termed resilient self-efficacy. In this case, a child's belief in their ability is reinforced through experience within a difficult scenario contributing to the development of perseverance and resilience (Denston, 2018). As such, a child's self-efficacy in reading will form their expectations of their likelihood to succeed or fail, which then shapes their behaviour and thus their subsequent achievement.

Self-efficacy may also affect achievement though motivational pathways which influence students' engagement and persistence in learning tasks (Linnenbrink & Pintrich, 2003). In their literature review, Linnenbrink and Pintrich (2003) concluded that three mediational processes were associated with self-efficacy: behavioural, cognitive, and motivational engagement. Behavioural engagement includes behaviours such as effort, persistence, and help-seeking, see Figure 2. Those with high self-efficacy put in more effort, persist longer, and ask questions with the aim of developing knowledge and ability to complete the task which produces a higher quality of learning and achievement. Cognitive engagement means that those with high self-efficacy use deeper processing and meta-cognitive learning strategies. These students are more likely to think more deeply about their

schoolwork and check their learning, spending more time recognising faulty understanding and repairing it, which leads to more effective learning and higher achievement. Motivational engagement refers to the levels of interest, value, and positive feelings students have towards a particular topic. Students who are naturally interested in a subject or perceive it to be important to learn will engage in the topic and develop their understanding, and thus their self-efficacy in that topic, leading to better learning and higher achievement. These three pathways are interrelated and underpinned by levels of self-efficacy. This finding emphasises the multifaceted link between levels of self-efficacy and academic achievement. Self-efficacy affects learning and achievement through these mediational pathways, and in addition, said achievement informs self-efficacy, completing the cycle (Linnenbrink & Pintrich, 2003).

Figure 2
A General Framework for Self-Efficacy, Engagement, and Learning (Linnenbrink & Pintrich, 2003)



Levels of self-efficacy have been found to be predictive of academic outcomes in older children (Bandura et al., 1996) and young adults (Pajares & Miller, 1994). Those who

have high self-efficacy have high levels of achievement, whereas those who have low self-efficacy have lower achievement (Schunk, 1981). Multon et al. (1991) conducted a meta-analysis on the relationship between self-efficacy and academic achievement, finding support for a positive and statistically significant relationship between the two variables over a variety of studies, subjects, research designs, and assessment methods. They found a stronger relationship with those who had low achievement when compared to those achieving at a normal level. Stronger associations between emotional self-efficacy and achievement in low achievers compared to high was also found in Denston (2016). Multon et al. (1991) also found a stronger effect in high school and university age students, compared to elementary age students.

There is currently scant research regarding self-efficacy from school entry. While research with school children exists, it tends to be with the older children in primary school rather than children at school entry. Usher et al. (2019) investigated American elementary and middle school students' levels of self-efficacy in terms of reading and maths achievement. They found that self-efficacy levels were significantly and positively predictive of all four math and reading outcomes. Children with low self-efficacy tended to achieve lower and those with high self-efficacy tended to achieve higher. The influence of self-efficacy on academic outcomes appears significant. In addition, Liew et al. (2008) found that academic self-efficacy beliefs at the end of the second year of school were associated with high literacy achievement in the third year of school.

There is a small amount of research which has found a positive relationship between self-efficacy and achievement in very young children (Lee & Jonson-Reid, 2016; Liew et al., 2008; Wilson & Trainin, 2007). Lee and Jonson-Reid (2016) and Wilson and Trainin (2007) found an association between self-efficacy and literacy achievement in students after 1 year of school showing that self-efficacy had developed after 1 year of schooling. However,

Chapman and Tunmer (2003) suggest that perceptions of the self may begin to develop as soon as children begin experiencing success or failure in reading, as early as 6 weeks after beginning school. However, this research only investigated self-concept, a subdomain of self-esteem which refers to a person's self-esteem in a particular area such as academic reading and writing (Everatt & Denston, 2020). Nevertheless, it is advantageous to focus on the early years of schooling when investigating self-efficacy to further uncover the nature of self-efficacy development.

One difficulty with self-efficacy research has been that the term 'self-efficacy' is used across levels of specificity. Different levels of specificity affect whether self-efficacy is associated with academic outcomes. Usher et al. (2019) found that subject specific measurements of self-efficacy (math and reading self-efficacy) were positively correlated with their corresponding academic outcomes (math and reading outcomes). This suggests that more specific measures of self-efficacy are more strongly associated with their specific subject's academic outcomes. In addition, Peura et al. (2019) hypothesised that the relationship between self-efficacy and reading outcomes is stronger when the measures increase in specificity. Peura et al. (2019) found that academic self-efficacy, which is how a student feels about academics in general, was not related to literacy skills and development. Conversely, reading self-efficacy that measured how a student felt about reading in general, was positively related to reading fluency. Children with high reading self-efficacy were more fluent readers than those with low reading self-efficacy. However, Denston (2016) measured general self-efficacy and found it to be related to literacy. It may be advantageous to assess self-efficacy at different levels of specificity. Much of the research considers self-efficacy more specifically (Lee & Jonson-Reid, 2016; Liew et al., 2008; Wilson & Trainin, 2007) rather than general self-efficacy, as self-efficacy, by definition, is task and subject specific (Everatt & Denston, 2018).

Self-Efficacy, Fluency and Comprehension

In addition to the research surrounding self-efficacy and literacy achievement, some research has investigated how specific literacy skills may be related to self-efficacy. This is important as the literacy element related to self-efficacy may differ based on the age of the children. Hornstra et al. (2013) found that high self-efficacy is linked to high reading achievement in upper primary school children, however their findings mainly focused on reading comprehension. Although some researchers have identified a positive relationship between fluency and self-efficacy in children from 8–11 years old (Carroll & Fox, 2017; Peura et al., 2019), others have found the converse. Denston (2016) found that reading rate, a fluency measure, was negatively correlated with self-efficacy with the same age group. However, Denston (2016) conducted a literacy intervention with students with literacy learning difficulties and observed change over time, while Carroll and Fox (2017) conducted a correlational analyses at a single timepoint and Peura et al. (2019) conducted a study over 2 years of school both with children with a range of reading abilities. It is possible that the negative relationship found in Denston (2016) may have been affected by the sample of students who had been identified as those with literacy difficulties. Perhaps those with higher self-efficacy experiencing an intervention tended to read more slowly because they were attempting to decode more words using word-level skills (Denston, 2016). Carroll and Fox (2017) failed to find a correlation between self-efficacy and comprehension. This suggests that children may build their self-efficacy around reading fluency and word reading rather than comprehension. However, this may be related to developmental levels as these findings (Carroll & Fox, 2017; Denston, 2016; Peura et al., 2019) were with 8–11 year old children.

Peura et al. (2019) noted that young children may have differing opportunities to develop self-efficacy depending on the types of skills emphasised at different developmental stages. Bandura (1997) describes social aspects and comparison as one of the ways self-

efficacy develops, thus a lack of social comparison early in school may mean development of self-efficacy may be independent of ability as children have reduced opportunity to compare themselves to peers. Reading aloud typically occurs in small groups in the early years of schooling as students work their way through learning to read books. Therefore, students will have more opportunity to compare themselves to their peers in fluency rather than in comprehension (Peura et al., 2019). Comprehension is typically not a focus of the early years at school. Children focus on learning to decode, and on reading words earlier in the learning to read process. It follows that self-efficacy in reading develops in response to the skill areas that are focused on within teaching and learning programmes as past experiences of literacy are the primary influence to the development of self-efficacy (Bandura, 1977). Students may not be aware of their ability to comprehend text as that is not the focus of learning, consequently they may not develop self-efficacy in response to their ability in this area. However, they are aware of their ability to decode and read fluently and so are likely to build self-efficacy levels around these previous experiences of mastery.

It has been established that early reading fluency difficulties are linked to later comprehension difficulties (Peura et al., 2019; Torgesen et al., 2001). However, neither Peura et al. (2019) or Torgesen et al. (2001) considered children from school entry. Regardless, in the process of learning to read, fluency is an important stage in achieving automaticity (Tunmer & Chapman, 2002). Reading fluency is a signal that the reader has reached the point where they can primarily focus cognitive effort on understanding what is being read rather than spending effort decoding. This lends itself to the 'reading to learn' stage of learning to read (Pikulski & Chard, 2005). Peura et al. (2019) conducted a study with children who were Grades 2–8 (Years 3–9 in Aotearoa New Zealand), and they found self-efficacy accounted for between 34% and 47% of the variance of the level of reading fluency. Self-efficacy also predicted fluency development across all grade levels investigated, meaning that children

with high levels of self-efficacy improved fluency at a higher rate than those with lower self-efficacy. This indicates that students who have high belief in their ability to succeed at reading tasks are more likely to also be progressing and learning faster than students who do not. This may be because fluent readers are at the phase of reading where they are able to use Share's (1995) self-teaching strategy to make advances in reading independently. However, less fluent readers are likely to still be committing more basic words to lexical memory as 'sight words' and are therefore advancing more slowly in their reading. While the evidence suggests that fluency may be related to comprehension throughout school, more research is needed in this area with children from school entry.

Tunmer and Chapman (2002) examined the strategies used by beginning readers to decode words in relation to reading achievement, reading skills, and academic self-perceptions in a 3-year longitudinal study with children from school entry through to their third year at school. They found that children who used word-based strategies such as decoding had more positive reading self-efficacy and performed better at word reading, and had higher comprehension levels 1 and 2 years later when compared with children who used strategies like contextual guessing (Tunmer & Chapman, 2002). Children who struggled with word-based strategies tended to rely on text-level cues, which led to greater guesswork and error. These children had significantly lower reading self-efficacy during the middle of their third year at school (Tunmer & Chapman, 2002). The link between high self-efficacy and effective reading strategies suggests the relationship between self-efficacy and achievement is at least partly due to strategy use. Greater use of effective reading strategies is associated with high self-efficacy and better reading outcomes, with high self-efficacy leading to greater motivation, persistence, and effort that leads to better strategy use and learning procedure, and eventually, better reading skills. This suggests that from school entry better ability to

decode and the use of more effective decoding strategies is related to better comprehension and word reading, and higher self-efficacy levels later in school.

Behaviour

Self-efficacy is both affected by and influences a person's behaviour. This has important implications particularly in the educational context. Bandura et al. (1996) found that behaviour mediated the relationship between self-efficacy and academic achievement. Self-efficacy levels can create a self-fulfilling prophecy effect where if a person believes that they can succeed, they are more likely to try harder and persist at a difficult task and are therefore more likely to achieve success. Conversely, those who do not believe they can succeed may give up, even if the task is within their skillset. Chapman and Tunmer (2003) found that those with low self-efficacy will be more likely to give up quickly and engage in off task or avoidant behaviours. This aligns with Nell (1988) who suggested that if a task is frustrating, motivation to engage in this task is low if external incentives are not provided. In this way, self-efficacy levels may affect the way a person behaves when presented with a task, and so this behaviour then affects the outcome. Therefore, the behaviours that people engage in can differ according to self-efficacy level and consequently have an impact on academic outcomes.

Research around the association between self-efficacy and behaviour has had varied results in children. Lee and Jonson-Reid (2016) found no association between self-efficacy and behaviour in first through third graders. However, Multon et al. (1991) found a positive association between self-efficacy and persistent behaviours. Persistence was categorised as time spent on task and number of items completed in a task suggesting that high self-efficacy may be linked to more attentive behaviours. In addition, Prochnow et al. (2013) conducted a 7-year longitudinal study with children starting when they were new entrants. The study investigated literacy-related skills, behaviour problems, and literacy achievement, and

reading self-perceptions which included a measure of reading self-efficacy. While they found a consistent and reciprocal relationship between literacy achievement and inattentive behaviours and a consistent and reciprocal relationship between literacy achievement and reading self-perceptions, no reciprocal relationship was found between inattentive behaviours and reading self-perception. This would suggest that higher inattentive behaviours are not associated with negative reading self-perception, but that literacy achievement has a reciprocal relationship with both inattentive behaviours and reading self-perceptions individually. However, this study focused on reading self-perceptions including both self-concept and self-efficacy which may have contributed to the lack relationship found between self-efficacy and inattention.

Inattentive behaviour and hyperactive behaviours have both been found to be associated with reading outcomes early in school (Velting & Whitehurst, 1997). However, there is more evidence for inattentive behaviour in early schooling having an association with reading outcomes (Dittman, 2016; Prochnow et al., 2013; Sims & Lonigan, 2013). Sims and Lonigan (2013) found that inattention was uniquely correlated with emergent literacy skills in 3–6-year-olds but did not find a relationship between hyperactivity/impulsivity and emergent literacy skills. In addition, Dittman (2016) found that inattentive behaviours at the time of commencing primary school were linked to word reading at first and second grade. This supports the finding by Prochnow et al. (2013) of a link between literacy and inattentive behaviours. However, neither of these studies measured self-efficacy.

Lee and Jonson-Reid (2016) measured classroom behaviour alongside their work on self-efficacy and achievement in reading in first through third graders. They found that while behaviour was not associated with self-efficacy, it was a significant predictor of achievement. Multon et al. (1991) conducted a meta-analysis with elementary, high school and college students investigating self-efficacy, academic outcomes, and behaviour in the form of

persistence. They found that persistent behaviour was a significant predictor of reading achievement but was not associated with self-efficacy. They found a stronger effect for those in high school and college. It seems that self-efficacy and academic outcomes are correlated, as is behaviour and academic outcomes, but more research is required to understand the associations during the early years of schooling.

The Aotearoa New Zealand Context

For a long time, teachers in Aotearoa New Zealand largely followed a constructivist approach to teaching reading, based on the whole language theory which argues that reading develops much the same as learning to speak (Arrow et al., 2015). There has been some change recently with the incorporation of phonics instruction into the literacy teaching practice of most schools (Chapman, Greaney, et al., 2018). However, these phonics programs vary in effectiveness based on the particular program utilised and the teacher's knowledge and understanding of basic language constructs (Chapman, Greaney, et al., 2018).

It may be suggested that this constructivist approach to literacy may play a part in the Matthew effect being particularly prevalent in Aotearoa New Zealand as evidenced by the long tail of underachievement as the teaching system does not provide explicit word-based literacy instruction in how to learn to read for those children who need it (Tunmer & Chapman, 2015). The long tail of underachievement refers to the distribution of literacy scores of children in Aotearoa New Zealand. The mean literacy score is similar to that of other comparably developed countries, however there is a large disparity in the range of scores (high and low), with Māori, Pasifika, children from low income backgrounds and low socioeconomic communities trailing far below the average, creating a long tail of under achievement (Elley, 1992; Tunmer et al., 2013). Addressing literacy needs early in school and potential impacts on behaviour and self-efficacy may have an effect on this and stop early difficulties in learning to read that result from a disadvantaged background, from

creating a cycle of low educational attainment (Chapman, Arrow, et al., 2018) that has the potential to extend beyond education to later life.

Aims of the Current Research

There is a limited amount of research on self-efficacy and its relationship to behaviour in younger learners in Aotearoa New Zealand. The overall aim of this research is to investigate the association between literacy, self-efficacy, and behaviour in a sample of Aotearoa New Zealand children within the first 3 years of their formal education. The research aims to answer the following research questions.

Research Questions

1. Is there an association between self-efficacy, literacy, and behaviour in children aged 5–7? It is hypothesised that self-efficacy will be associated with literacy, and literacy will be associated with behaviour, but self-efficacy will not be associated with behaviour.
2. If there is an association between any two of these variables, is that relationship mediated by the third variable? It is hypothesised that the expected correlation between self-efficacy and literacy will not be mediated by behaviour, and the correlation between literacy and behaviour will not be mediated by self-efficacy.
3. Does the level of self-efficacy at the end of Year 1 influence literacy development at Year 2 and Year 3? It is hypothesised that those with high self-efficacy at the end of Year 1 will have higher scores in literacy across the time points. Additionally, if there is a difference between literacy achievement given Year 1 self-efficacy, then this difference will continue, and widen over time showing a Matthew effect (the group with low self-efficacy will slowly fall further and further behind the group with high self-efficacy in terms of literacy development).

Chapter 3: Method

This section outlines the data analysed, including the source of the data, details of the participants, variable measures, the time points data were collected, and the process of checking that the data was fit for statistical analysis.

Data

This research conducted a secondary analysis of data from The Early Literacy Project. The Early Literacy Project was a longitudinal study conducted by Arrow, Chapman, Braid, and Tunmer at Massey University. The study ran from February 2015 to July 2017 and focused on non-readers transitioning to beginning readers through improving teacher knowledge of word-level instruction. Specifically, it investigated the effect of increasing teachers' knowledge of code-based instruction over meaning-based with early readers with fewer basic reading skills. The first year of the study (2015) included an intervention and control cohort. The teachers included in the intervention group participated in six Professional Learning Development (PLD) days over the course of a year. Results failed to identify any statistical differences between literacy scores between the intervention and control group in Cohort 1 following the intervention. During the 2nd year of the study (2016), the original control and intervention groups were followed as well as a new intervention group of new entrants where the teachers were given a revised PLD course, adapting the intervention due to there being no effect as a result of the first intervention. There was also a new control group of classes that did not participate in either intervention. The original cohort, Cohort 1 was not given any further interventions and their data was collected throughout the duration of the study. While the original research did investigate self-efficacy scores, they found no significant difference between self-efficacy scores between cohorts, regardless of intervention, and actual reading-related achievement (Chapman, Arrow, et al., 2018).

Participants

This thesis focuses on the longitudinal data from the first cohort of students from the Early Literacy Project who began in 2015. As there were no differences between literacy scores found between intervention and control groups in this cohort, the two groups have been treated as one and analysed together.

Demographics

The Early Literacy Project included 374 students from 39 schools, of whom 208 (55.6%) were in the intervention group and 116 (44.4%) were in the control group. For the purposes of the current thesis, data was analysed as a single group. The sample included 177 females (47%) and 197 males (53%). The students came from a range of schools including 116 students (31%) from schools of Decile 1–3, 165 (44.1%) were from Deciles 4–7 and 93 students (24.9%) from schools Decile 8–10. Deciles are a measure of the socio-economic status of the community of the school's students compared to other schools throughout the country (Ministry of Education, n.d.). Deciles are calculated using indicators such as employment status, income, and level of education of households in the residential area of students who attend the school. Schools with a higher proportion of students from low-socio economic communities will have a lower decile (Ministry of Education, n.d.). Deciles are used by the Ministry of Education in Aotearoa New Zealand to assign funding to schools.

Measures

Three types of measurement were used for the three variables: literacy, self-efficacy, and behaviour. Literacy was measured using the Wide Range Achievement Test – Spelling subtest (WRAT-S; Wilkinson & Robertson, 2008), Pseudoword reading total (PW-T), Pseudoword reading phoneme (PW-P; Chapman, Arrow, et al., 2018), Burt word reading test (Gilmore et al., 1981), and Comprehensive Test of Phonological Processing Second Edition – Elision subtest (CTOPP-E; Wagner et al., 2013). Self-efficacy (SE) was measured using a

six-item task created by Chapman, Arrow, et al. (2018). Behaviour was measured using the Conners Teacher Rating Scale revised for younger children by Purpura and Lonigan (2009; Conners-T, Conners-I, Conners-U, Conners-H).

Literacy Measures

Wide Range Achievement Test - Spelling. The WRAT-4 spelling subtest (Wilkinson & Robertson, 2008) was used to assess spelling. The spelling section of the test contains 42 test items. All children (regardless of age) are asked to spell a series of words. The administrator reads the word and a sentence with the word in it. The words increase in difficulty (from "go" through to "mnemonic"). Children were given 1 point for each correctly spelled word. The test continued until they got 10 consecutive words incorrect. WRAT-S has a high reported reliability with Cronbach's alpha > .80 (Wilkinson & Robertson, 2008).

Pseudoword Reading Total and Pseudoword Reading Phoneme. As these are pseudowords, children had not encountered these items before, therefore this test measures children's ability to decode and blend new words. The test used to assess pseudoword reading came from a pseudoword spelling test (Chapman, Arrow, et al., 2018). The pseudoword reading test consists of 30 non-words which increased in complexity over the course of the test. The complexity of the word's construction ranges from simple non-words in the form of CVC (consonant-vowel-consonant e.g., 'jit') to complex non-words in the form of CCVC (consonant-consonant-vowel-consonant) and those containing consonant blends and both vowel and consonant diagraphs (e.g., 'fleach' – CCVVCC). The test was scored in two different ways. The first is to reflect ability to decode phonemes within pseudowords, pseudoword reading phoneme (PW-P) and the other is to reflect ability to read phonemes and blend into a pseudoword, pseudoword reading total (PW-T). For the first method of scoring, PW-P, points are awarded on the number of correctly decoded phonemes (consonant, short vowel, long vowel, digraph). It is an outcome measure that tests decoding, which is the

child's ability to read phonemes without any other cues. There was a total possible score of 101 phonemes from 30 words. The test-retest reliability of this measure was high with a strong positive correlation between the two testing points $r = .649$ $p < .001$. The second method of scoring was PW-T where children received 1 point for each whole word read correctly. This scoring system reflects the ability to read phonemes and the ability to blend sounds into a word. It is an outcome measure which tests children's ability to use phonic knowledge, sounding out, and blending to decode unfamiliar words. There is a total possible score of 30. The test-retest reliability of this measure was high with a strong positive correlation between the two testing points $r = .665$ $p < .001$.

Burt Word Reading. The Burt Reading test was used to measure single word reading accuracy. Developed by the Scottish Council for Research in Education (SCRE, 1974), the New Zealand edition (Gilmore et al., 1981) of the measure is widely used in Aotearoa New Zealand. The test demonstrates high internal consistency with the Kuder-Richardson Formula 20 test, yielding a reliability co-efficient of .96 (Gilmore et al., 1981). This untimed, individually administered test consists of 110 real words that increase in complexity. All the words are presented on a page. There are five words arranged in a line across the page. Children read from left to right, top to bottom until 10 consecutive words are read incorrectly. Words increase in difficulty line to line (beginning with words such as "is", "up" and "for" and then the slightly more difficult "went" "some" and "day", slowly progressing to even more complex words like "scramble", "exhausted", "physician" and finishing with "subtlety"). Children receive 1 point for each correctly read word. The Burt word reading test measures a child's ability to read frequently encountered words out of context and is a good test of sight word knowledge, rather than only testing the ability to read new words by decoding. The maximum possible score is 110 and scores ranged from 0 to 93.

CTOPP Elision. CTOPP-Elison (CTOPP-E) is taken from the Comprehensive Test of Phonological Processing Second Edition CTOPP-2 (Wagner et al., 2013). This test is used to evaluate phonological processing abilities. The elision subtest measures the ability to remove phonological segments from spoken words and use them to form other words. The test includes 34 words containing a segment to be removed. The test increases in difficulty, beginning with the child being asked to remove a word from a compound word (say sunshine without saying sun), and then removing the initial phoneme from a word (say bold without saying b), to lastly removing a phoneme in the middle of the word (say faster without saying s). The test continues until the child is unable to correctly answer three items in a row. A higher score represents a higher level of complexity in sound and phonological manipulation. There is a maximum score of 34. CTOPP-E has good reported reliability with Cronbach's alpha > .80 (Wagner et al., 2013).

Self-Efficacy Measure

Reading self-efficacy (SE) was measured using a six-item task. Each item had four possible answers: agree a lot, agree a little, disagree a little and disagree a lot. These options were depicted through smiley faces. The scale measured children's perceptions of agency and control in reading (Tunmer & Chapman, 2002). The measure included three reverse coded items to avoid biasing a child's response. The researcher read the statements aloud to the child. A score of 1 indicated lower self-efficacy and a score of 4 indicated higher self-efficacy. With a possible range of scores from 6–24, higher scores indicate a higher self-efficacy. Cronbach's alpha was calculated for this scale and was found to be .55 which is lower than the .7 threshold usually required (DeVellis, 2017). However, when there are less than 10 items in a measure, and in this case there were 6 items, it is normal for the Cronbach's alpha to be lower than normal, around .5 (Briggs & Cheek, 1986).

Behaviour Measure

The behaviour scale used was adapted from the Conners Teacher Rating Scale Revised (CTRS-R; Conners et al., 1998) for use with preschool children by Purpura and Lonigan (2009). The current measure included the three subscales of inattention (Conners-I), hyperactivity (Conners-H), moody uncooperative (Conners-U) as well as the total behaviour including all three subscales combined (Conners-T). Each subscale contained five items that were all scored on the same scale of 0–3, with 0 = not true at all (never, seldom), 1 = just a little true (occasionally), 2 = pretty much true (often, quite a bit) and 3 = very much true (very often, very frequent). Each subscale had a maximum possible score of 15 while the Conners-T measure had a maximum possible score of 45. There is no reported reliability for the adapted preschool measure, however the original CTRS-R scale has a reported Cronbachs alpha of $> .80$ for children 3–7 years old (Conners et al., 1998).

Procedure

The original research by the Early Literacy Project (ELP) measured literacy from the start of Year 1 through to the middle of Year 3. Table 1 outlines the points for data collection. This thesis requires both a start and end point of scores, the start point being at the end of Year 1 and the end point at either the end of Year 2 or the middle of Year 3. The end of Year 1 will be referred to as T1 for the purposes of this study; this represents 1 year of learning at school. One measure, the WRAT-S, was not assessed at the end of Year 1 but as it was assessed at the start of Year 2, and as this is also after 1 year of learning at school this data is included in T1. Additionally, the latest time point available for PW-T, PW-P, and CTOPP-E were at the end of Year 2, so those data points will be used as the end point for those measures. The time point at the end of Year 2 will be referred to as T2, while the middle of Year 3 will be referred to as T3. This is depicted in Table 1.

Table 1
Literacy Measure Timepoints Collected and Labels Assigned

		Literacy measures collected				
	Timepoints	PW-T	PW-P	CTOPP-E	WRAT-S	Burt
End of Year 1/Start of Year 2	T1	√	√	√	√	√
End of Year 2	T2	√	√	√		
Middle of Year 3	T3				√	√

Note. PW-T = Pseudoword reading total, PW-P = Pseudoword reading phoneme, CTOPP-E = CTOPP Elision, WRAT-S = WRAT Spelling, Burt = Burt word reading.

Statistical Analysis

The analysis was conducted using SPSS statistical software program (version 26.0; SPSS, 2020). The data was examined for accuracy of input and the presence of outliers. Although there were outliers present, the adjusted means showed they did not have a significant effect on the data and so were not removed from analyses. Statistical analysis was carried out beginning with descriptive statistics. Pearson's correlations were obtained to look at the associations between self-efficacy, literacy, and behaviour scores. Mixed-between-within analysis of variance (ANOVA) with post-hoc analyses were performed to analyse how the association between self-efficacy and literacy measures changed across time.

Normality of the data were checked visually with histograms. The histograms were widely skewed most often showing a floor effect of most students scoring 0. This is to be expected for literacy measures as children had only just started school and literacy ability was low. Behaviour scores were positively skewed showing most children showing low levels of inattentive, moody-uncooperative, and hyperactive behaviours. Self-efficacy was negatively skewed showing most students rating themselves as highly efficacious in reading. Given the large sample size of the data, the parametric tests were used regardless of violation of the assumption of normality as the tests are reasonably robust when used with a large sample size such as this. These were verified with non-parametric tests (Spearman's Rho) where possible, which showed the same results as the parametric tests used (Pallant, 2020).

Preliminary analyses were performed prior to running a mixed-between-within subjects ANOVA to ensure no assumptions were violated. The same issue was present as with Pearson's correlation, the normality assumption was violated. The assumption of homogeneity of variance was also violated with each mixed-between-within subjects ANOVA showing at least one group's variance significantly differing from the others. However, ANOVA is reasonably robust and tolerant of violations of these assumptions when working with a large sample size like the present sample ($n > 30$) and when the groups are of similar size such as in this data (Stevens, 1996).

An independent samples t-test was run on PW-P, PW-T, CTOPP-E, WRAT-S and Burt to check whether the variance of the groups differed significantly when compared to their non-parametric equivalent. The outcome of these t-tests was compared to their non-parametric equivalent (Mann-Whitney test) to see if the violation of the assumption would have an effect on the result. The results of the parametric and non-parametric tests were equivalent, so the research continued with the mixed-between-within subjects' ANOVA.

Chapter 4: Results

The current study includes three research questions. Firstly, is there an association between self-efficacy, literacy, and behaviour in children aged 5–7? Secondly, if there is an association between any two of these variables, is that relationship mediated by the third variable? Lastly, does the level of self-efficacy at the end of Year 1 influence literacy development over time? To answer these questions, the following analyses were conducted using SPSS (Version 26.0): descriptive statistics, correlation and partial correlation using Pearson's correlation coefficient verified with Spearman's Rho, and mixed-between-within subjects ANOVA verified with an independent samples t-test. Pearson's correlations were performed to identify any correlations between self-efficacy, literacy, and behaviour. Partial correlations were performed between each of the correlation pairs controlling for the effect of the third variable. Mixed between within ANOVAs were performed to determine the effect of self-efficacy on literacy development over time.

A significance level of .05 was used to determine the statistical outcomes of this research. Cohen's (1988) guidelines for determining effect sizes for Pearson's correlations were used, a correlation of r = .10 to .29 was considered small, a correlation of r = .3 to .49 is medium, and r = .50 to 1.0 is large. Skewness and kurtosis are included to show the distribution and symmetry of the data and to allow comparison from T1 to T2 and T3. Correlations between variables at the same timepoint are referred to as concurrent correlations while across time correlations are referred to as subsequent correlations. Correlations between T2 and T3 are referred to as concurrent as both represent the final timepoint available for each literacy variable. T2 was measured at the end of Year 2 while T3 was measured in the middle of Year 3. Not all variables were measured in the middle of Year 3 so the end of Year 2 measures were used.

Descriptive Statistics

Descriptive statistics for T1 are presented in Table 2, and descriptive statistics for T2 and T3 are shown in Table 3. The literacy measures at T1 showed a floor effect, scores were typically low and skewed towards 0. Low scores in literacy at T1 are expected as children had only just begun schooling and literacy, therefore literacy abilities are likely lower. Scores on all literacy measures increased over the course of data collection. Behaviour measures also tended to be low and skewed towards zero as shown by the positive skewness statistic. As higher scores on the behaviour scale indicated high levels of each behaviour and low scores indicated low levels of each behaviour; the low mean value showed that most students demonstrated positive behaviour. The average score for behaviour varied between subscales. Moody uncooperative behaviour demonstrated the lowest mean scores, with inattentive and hyperactive behaviour showing slightly higher mean scores. Behaviour scores remained consistent across timepoints, with both mean score and standard deviation indicating similar variability from T1 to T3. The self-efficacy measure showed scores towards the upper end of the average range with a negative skewness statistic. The mean score was 17.44 at T1 and 18.43 at T3 from a maximum possible score of 24 meaning students tended to rate themselves as highly efficacious. The minimum score of self-efficacy at T1 was 8, this increased to 11 by T3 meaning that the distribution of self-efficacy scores decreased over time. The kurtosis statistic indicates most variables scores are clustered in the middle of their possible range of scores with a positive kurtosis value, with the occasional variable (T1 PW-P, T1 SE) having a negative value, indicating these variables have a relatively flat distribution. However, in sample sizes larger than 200 this will not have a significant effect on results.

Table 2

Descriptive Statistics for T1 Measures Used in Correlational Analyses

					Skewness		Kurtosis	
	N	M	SD	Range	Statistic	SD	Statistic	SD
Literacy measures								
T1 CTOPP-E	304	12.14	6.513	0-32	.333	.140	.455	.279
T1 PW-T	296	4.52	6.231	0-30	1.751	.142	2.913	.282
T1 PW-P	297	37.03	32.856	0-101	.256	.141	-1.463	.282
T1 Burt	304	18.07	12.234	0-93	1.240	.140	4.094	.279
T1 WRAT-S	300	2.63	2.278	0-18	1.697	.141	6.643	.281
T1 Self-efficacy	282	17.44	3.353	8-24	-.300	.145	-.156	.289
Behaviour measures								
T1 Conners-H	205	3.24	3.623	0-15	1.117	.170	.541	.338
T1 Conners-I	204	4.00	3.764	0-15	1.080	.170	.640	.339
T1 Conners-U	205	1.75	2.723	0-14	1.999	.170	4.180	.338
T1 Conners-T	202	8.97	8.703	0-38	1.187	.171	.913	.341

Note. PW-T = Pseudoword reading total, PW-P = Pseudoword reading phoneme, CTOPP-E = CTOPP Elision, WRAT-S = WRAT Spelling, Burt = Burt word reading, Conners-T = Conners total score, Conners-I = inattention, Conners-U = moody uncooperative, Conners H = hyperactive.

Table 3

Descriptive Statistics for T2 and T3 Measures Used in Correlational Analyses.

					Skewness		Kurtosis	
	N	M	SD	Range	Statistic	SD	Statistic	SD
Literacy measures								
T2 CTOPP-E	276	17.13	6.271	0-34	.750	.147	.705	.292
T2 PW-T	275	11.61	8.794	0-30	.434	.147	-.886	.293
T2 PW-P	275	72.81	21.905	0-101	-1.119	.147	.855	.293
T3 Burt	266	39.65	17.099	0-88	.466	.149	.004	.298
T3 WRAT-S	266	6.51	3.727	0-21	.798	.149	.399	.298
T3 Self-efficacy	253	18.43	2.676	11-24	-.545	.153	.073	.305
Behaviour measures								
T3 Conners-H	206	3.26	3.637	0-15	1.103	.169	.477	.337
T3 Conners-I	205	4.03	3.795	0-15	1.067	.170	.561	.338
T3 Conners-U	206	1.80	2.808	0-14	1.998	.169	4.051	.337
T3 Conners-T	203	9.07	8.840	0-38	1.192	.171	.876	.340

Note. PW -T = Pseudoword reading total, PW-P = Pseudoword reading phoneme, CTOPP-E = CTOPP Elision, WRAT-S = WRAT Spelling, Burt = Burt word reading, Conners-T = Conners total score, Conners-I = inattention, Conners-U = moody uncooperative, Conners H = hyperactive.

Is There an Association Between Self-Efficacy, Behaviour and Literacy?

The first aim of this research was to determine if there was an association between self-efficacy, literacy and behaviour in children aged 5–7. To address this question, Pearson's correlations were conducted to determine whether these associations were present. The results are presented in Table 4.

All correlations between measures of literacy and SE were significant. Higher scores in SE were correlated with higher scores in literacy across all measures. However, these correlations were small with one correlation reaching medium strength. SE at T1 was positively correlated with all five literacy variables at T1. At T1 the largest of these small correlations was observed between SE and PW-P $r = .278$, $p < .001$, and SE and WRAT-S $r = .277$, $p < .001$. T3 SE was positively correlated with all literacy measures at T2. The largest of these small correlations was observed between CTOPP-E and T3 SE, $r = .265$, $p < .001$. T3 SE was positively correlated with all T3 literacy measures, including a medium correlation with T3 Burt $r = .320$, $p = < .001$ which was the largest correlation between literacy and self-efficacy in the study. CTOPP-E, WRAT-S and Burt literacy measures were similarly correlated with SE at both timepoints; however, PW-T and PW-P were more highly correlated with SE at T1. T1 SE and T1 PW-T were positively correlated $r = .257$ $p < .001$ compared to at T3 SE and T2 PW-T, $r = .161$, $p = .012$. In addition, T1 SE and T1 PW-P were correlated $r = .278$, $p < .001$, while T3 SE and T2 PW-P were more weakly correlated $r = .167$, $p = .009$.

Across time, subsequent associations between self-efficacy and literacy were also observed. Like the concurrent correlations, literacy and self-efficacy were positively correlated across timepoints. T1 SE was positively correlated with all T2 literacy measures. T1 SE and T2 PW-T were correlated $r = .177$, $p = .005$, while T1 SE and T2 PW-P were also correlated $r = .182$, $p = .004$. These correlations were weak, similar to the concurrent T2 and

T3 associations (between T3 SE and T2 PW-T, and T3 SE and T2 PW-P respectively) rather than the concurrent T1 correlations (between T1 SE and T1 PW-T, and T1 SE and T1 PW-P). Note T2 and T3 are used as if they are concurrent as both represent the final timepoint available for each literacy variable. T1 SE was also positively correlated with all literacy measures at T3. Similarly, higher scores on all the literacy measures at T1 were associated with higher self-efficacy scores in T3, see Table 4. All these correlations were rather similar to their T1 SE and T1 literacy variables counterparts. This indicates that the development of literacy skills in T1 is associated with higher self-efficacy at T3.

Analysis identified a negative association between T1 SE and both T1 Conners-T, r = -.178, p = .019 and T1 Conners-I, r = -.264, p < .001. Higher levels of self-efficacy were associated with lower scores on Conners-I and thus less inattentive behaviours. Analyses did not identify an association between T1 SE and either T1 Conners-U, or T1 Conners-H. No statistically significant correlations were found between T3 SE and any of the behaviour scales at T3. This suggests that T3 SE is not associated with more inattentive, moody uncooperative or hyperactive behaviours at T3.

However, T1 SE was weakly, negatively, associated with T3 Conners-I, r = -.263, p < .001, and T3 Conners-T, r = -.177, p = .019 indicating that higher scores of self-efficacy at T1 were associated with lower scores of T3 Conners-I and Conners-T. These associations were weak, like their T1 SE and T1 Conners counterparts, indicating that T1 SE is similarly associated with inattentive behaviour at T1 and at T3. Once again, while showing a weak correlation, Conners-I was stronger and more significantly correlated with T1 SE than Conners-T. No correlations were found between T1 SE and either T3 Conners-H or T3 Conners-U. No statistically significant correlations were found between T3 SE and any of the behaviour scales at T1. This suggests that inattentive, moody uncooperative or hyperactive behaviours at T1 are not associated with T3 SE.

Table 4

Correlational Analyses Between Self-Efficacy, Literacy Variables and Behaviour Variables.

	T1 WRAT-S	T1 PW-T	T1 PW-P	T1 Burt	T1 CTOPP-E	T1 Self-efficacy	T1 Conners-H	T1 Conners-I	T1 Conners-U	T1 Conners-T	T3 WRAT-S	T2 PW-T	T2 PW-P	T3 Burt	T2 CTOPP-E	T3 Self-efficacy	T3 Conners-H	T3 Conners-I	T3 Conners-U
T1 PW-T	.727**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T1 PW-P	.714**	.811**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T1 Burt	.837**	.796**	.806**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T1 CTOPP-E	.660**	.621**	.673**	.703**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T1 Self-efficacy	.277**	.257**	.278**	.264**	.252**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T1 Conners-H	-.159*	-.127	-.179*	-.200**	-.166*	-.081	-	-	-	-	-	-	-	-	-	-	-	-	-
T1 Conners-I	-.356**	-.328**	-.373**	-.407**	-.350**	-.264**	.710**	-	-	-	-	-	-	-	-	-	-	-	-
T1 Conners-U	-.193**	-.193**	-.238**	-.214**	-.192**	-.125	.606**	.449**	-	-	-	-	-	-	-	-	-	-	-
T1 Conners-T	-.282**	-.259**	-.319**	-.334**	-.287**	-.178*	.917**	.872**	.762**	-	-	-	-	-	-	-	-	-	-
T3 WRAT-S	.794**	.682**	.700**	.795**	.654**	.240**	-.270**	-.453**	-.218**	-.385**	-	-	-	-	-	-	-	-	-
T2 PW-T	.727**	.665**	.716**	.752**	.661**	.177**	-.122	-.360**	-.146	-.261**	.803**	-	-	-	-	-	-	-	-
T2 PW-P	.631**	.542**	.649**	.673**	.607**	.182**	-.183*	-.395**	-.232**	-.329**	.696**	.853**	-	-	-	-	-	-	-
T3 Burt	.781**	.714**	.747**	.845**	.723**	.261**	-.205**	-.419**	-.187*	-.332**	.858**	.839**	.774**	-	-	-	-	-	-
T2 CTOPP-E	.705**	.641**	.650**	.731**	.691**	.262**	-.192*	-.396**	-.192*	-.320**	.741**	.730**	.664**	.786**	-	-	-	-	-
T3 Self-efficacy	.165**	.218**	.236**	.257**	.237**	.199**	-.033	-.099	.019	-.051	.250**	.161*	.167**	.320**	.265**	-	-	-	-
T3 Conners-H	-.169*	-.126	-.177*	-.197**	-.162*	-.083	.991**	.699**	.604**	.908**	-.280**	-.125	-.180*	-.211**	-.190*	-.066	-	-	-
T3 Conners-I	-.369**	-.328**	-.374**	-.404**	-.349**	-.263**	.699**	.979**	.446**	.857**	-.467**	-.361**	-.388**	-.426**	-.392**	-.146	.714**	-	-
T3 Conners-U	-.211**	-.195**	-.241**	-.217**	-.197**	-.120	.581**	.419**	.969**	.728**	-.240**	-.154*	-.217**	-.202**	-.186*	-.031	.609**	.466**	-
T3 Conners-T	-.296**	-.260**	-.320**	-.333**	-.288**	-.177*	.896**	.844**	.750**	.975**	-.400**	-.263**	-.318**	-.341**	-.313**	-.100	.916**	.874**	.771**

Note. PW-T = Pseudoword reading total, PW-P = Pseudoword reading phoneme, CTOPP-E = CTOPP Elision, WRAT-S = WRAT Spelling, Burt = Burt word reading, Conners-T = Conners total score, Conners-I = inattention, Conners-U = moody uncooperative, Conners H = hyperactive.

** Correlation is significant at the 0.01 level (two tailed) * Correlation is significant at the 0.05 level (two tailed).

While the correlations between T1 Conners-I and T1 SE, and T3 Conners-I and T1 SE were weak, they are stronger than the correlation between T1 Conners-T and T1 SE, and T3 Conners-T and T1 SE. Neither Conners-H nor Conners-U were significantly correlated with SE at any timepoint. This suggests that inattention is the main contributing factor of the behaviour scales and not moody uncooperative behaviour or hyperactivity.

All literacy variables at T1 were negatively associated with T1 Conners-U, Conners-I and Conners-T, see Table 4. T1 Conners-H was negatively associated with all literacy variables except T1 PW-T. High scores on the literacy variable were associated with lower scores on the behaviour scale and thus less of the relevant behaviour. T1 Conners-U and T1 Conners-H were significantly associated with T1 literacy variables however, these associations were small in strength. The negative associations between T1 Conners-T and T1 literacy variables were medium strength in the case of T1 PW-P and T1 Burt, and small in the case of T1 PW-T, T1 CTOPP-E and T1 WRAT-S. However, each of the associations between T1 Conners-I and all T1 literacy variables reached medium strength, the largest correlation was a medium strength correlation identified for T1 Burt and T1 Conners-I r = -.407, p < .001. The correlations between Conners-I and literacy were stronger than those between literacy and the other subscales, and the total score indicating that inattention was the type of behaviour most highly associated with literacy at T1.

Analyses identified a significant negative correlation between all literacy variables at T2 and T3 Conners-U, Conners-I and Conners-T. T3 Conners-H was negatively associated with all T2 literacy variables except T2 PW-T see Table 4. In addition, analysis identified a significant negative correlation between all T3 literacy variables and T3 Conners-H, Conners-U, Conners-I and Conners-T. These correlations were similarly small or medium strength correlations like their corresponding concurrent correlation found at T1. Similarly, to the concurrent T1 correlations, the correlations between T3 Conners-I and T2 and T3 literacy

were larger than those between literacy and the other subscales and the total score at the later time point. In fact, the correlations between inattention and literacy at the later time point were larger than their corresponding correlation between T1 Conners-I and T1 literacy variables. Most highly correlated was T3 Conners-I and T3 WRAT-S $r = -.467$, $p < .001$ which is approaching a large correlation and is the largest correlation between any behaviour subscale and literacy variable across all time combinations in this research.

In addition to the concurrent correlations, the across time (subsequent) correlations were also considered. Analysis identified a significant negative correlation between all T2 literacy variables, T3 literacy variables and T1 Conners-I and Conners-T see Table 4. T1 Conners-U was negatively associated with all later literacy variables except T2 PW-T. T1 Conners-H was negatively associated with all later literacy variables except T2 PW-T. Like the concurrent correlations, T1 Conners-I is most highly correlated with T2 and T3 literacy measures. The Conners-I associations were all medium strength with the association between end of T1 Conners-I and T3 WRAT-S approaching a large correlation $r = -.453$, $p < .001$. This indicates that early Conners-I is associated with lower literacy scores later in school more strongly than it is with literacy at the same time point (T1). Conners-I was more strongly correlated than Conners-T measure. In fact, these across time correlations between Conners-I T1 and literacy at T2 and T3 were larger than their corresponding correlations at T1.

The association between literacy at T1 and behaviour at T3 were also investigated to see if there was a similar effect as between early behaviour and later literacy. All literacy variables at T1 were negatively associated with T3 Conners-U, T3 Conners-T and T3 Conners-I see Table 4. T3 Conners-H was negatively associated with all later literacy variables except T1 PW-T. Like the concurrent correlations, T3 Conners-I is most highly correlated with T1 literacy measures. The Conners-I associations were all medium strength

and similarly correlated to those observed in the concurrent correlations at T1, with the medium strength association between T3 Conners-I and T1 Burt being the largest correlation $r = -.404$, $p < .001$. Once again, Conners-I was more highly correlated than the Conners-T measure. This indicates that Conners-I has a larger association with literacy scores than Conners-T. Despite the compounded influence of Conners-U, Conners-H and Conners-I, Conners-T had a smaller correlation with literacy scores than Conners-I.

Notable findings from these correlations are that in all scenarios Conners-I, inattention was most highly correlated of all the behaviour variables across all time points. Conners-I was more largely correlated with both SE and literacy measures than Conners-T despite Conners-T being a compound variable of the behaviour subscales (Conners-I, Conners-U and Conners-H). The associations between T3 Conners-I and T2 and T3 literacy measures are larger than T1 Conners-I and T1 literacy measures, thereby suggesting the association between behaviour and literacy strengthens over years at school. In addition, it seems that early behaviour has a larger association with later literacy than it does with literacy at the same timepoint. T1 Conners-I correlation had a larger correlation with later literacy than T1 Conners-I and T1 literacy variables. The association between T1 Conners-I and later literacy variables was similar in strength to the association between T3 Conners-I and T3 literacy variables indicating that literacy scores at T2 and T3 are correlated with T1 inattentive behaviour scores, similarly to how they are correlated with T3 inattentive behaviours. Results indicated that PW-T was not associated with Conners-H in any combination explored.

Are the Correlations Mediated by Another Variable?

The second aim of the analyses was to examine whether any of the associations present between any two of the variables were mediated by the third variable. Partial correlations were conducted between each of the pairs on which correlations were previously

run using the third variable as mediator see Tables 5, 6 and 7 (for the partial correlation between SE and literacy variables, the mediator was behaviour variables; for literacy and behaviour the mediator was literacy variables, and for behaviour and SE the mediator was literacy variables).

The associations between T1 SE and T1 literacy are still statistically significant when partial correlations are run controlling for T1 Conners-I, Conners-H, Conners-U and Conners-T see Table 5. T1 Conners-I was the strongest mediator reducing the association between T1 SE and T1 PW-T from $r = .257$, $p < .001$ down to $r = .187$, $p = .013$. Nevertheless, the correlation between T1 SE and T1 literacy was still statistically significant after controlling for Conners-I, indicating that T1 SE is correlated with T1 literacy scores independent of Conners-I. The association between T3 SE and T2 PW-T was mediated by Conners-T, Conners-I and Conners-H, after controlling for these, the association was no longer significant. However, this association was most strongly mediated by Conners-I. The association between T2 PW-P and T2 SE was also mediated by Conners-I. The associations between these two variables and SE were weaker at T3 than the corresponding correlations at T1. The correlation between T2 SE and each of T2 CTOPP-E, T3 WRAT-S and T3 Burt were found to be independent of behaviour. None of these correlations were mediated by any behaviour variable.

Table 5
Partial Correlations Between Self-Efficacy and Literacy Controlling for Behaviour

		T1 PW-T	T1 PW-P	T1 CTOPP-E	T1 WRAT-S	T1 Burt	T2 PW-T	T2 PW-P	T2 CTOPP-E	T3 WRAT-S	T3 Burt
T1 Self-efficacy	Zero order correlation	.257**	.278**	.252**	.277**	.264**	.177**	.182**	.262**	.240**	.261**
	Control variable: T1 Conners-T	.222**	.238**	.213**	.240**	.221**	.137	.133	.220**	.188*	.218**
	Control variable: T1 Conners-I	.187*	.201**	.177*	.203**	.178*	.091	.088	.178*	.140	.172*
	Control variable: T1 Conners-U	.239**	.258**	.234**	.260**	.245**	.162*	.158*	.244**	.219**	.244**
	Control variable: T1 Conners-H	.250**	.269**	.243**	.268**	.254**	.169*	.171*	.252**	.227**	.251**
T3 Self-efficacy	Zero order correlation	.218**	.236**	.237**	.165**	.257**	.161*	.167**	.265**	.250**	**.320****
	Control variable: T3 Conners-T	.199*	.217**	.219**	.143	.238**	.154	.159*	.262**	.250**	**.321****
	Control variable: T3 Conners-I	.182*	.198*	.201*	.121	.219**	.118	.121	.228**	.208**	.288**
	Control variable: T3 Conners-U	.216**	.236**	.236**	.162*	.256**	.159*	.164*	.264**	.250**	**.320****
	Control variable: T3 Conners-H	.211**	.229**	.230**	.157*	.249**	.155	.158*	.257**	.242**	**.313****

Note. Cohen's (1988) guidelines include large correlations (r = .5 to 1.0), medium correlations (r = .30 to .49), and small correlations (r = .10 to .29). PW-T = Pseudoword reading total, PW-P = Pseudoword reading phoneme, CTOPP-E = CTOPP Elision, WRAT-S = WRAT Spelling, Burt = Burt word reading, Conners-T = Conners total score, Conners-I = inattention, Conners-U = moody uncooperative, Conners H = hyperactive. Boldface indicates medium correlations.

** Correlation is significant at the 0.01 level (two tailed) * Correlation is significant at the 0.05 level (two tailed).

The correlation between T1 literacy variable and T3 SE remains significant when controlling for T3 Conners-T, Conners-I, Conners-U and Conners-H. The only exception being the association between T1 WRAT-S and T3 SE which was mediated by Conners-I, indicating that T1 WRAT-S scores are not related to T3 SE scores independent of Conners-I. It is interesting that both subsequent, across time, correlations between WRAT-S and SE are mediated by Conners-I. The association between T1 SE and T3 WRAT-S was mediated by Conners-I, as was the association between T1 WRAT-S and T3 SE. WRAT-S scores measure spelling accuracy, so it might be concluded that while spelling accuracy is related to self-efficacy in the concurrent correlations at the same timepoint, spelling does not have a lasting effect on self-efficacy or vice versa.

T1 PW-T is associated with T3 SE independent of all behaviour variables. T1 PW-P is also associated with T3 SE independent of all behaviour variables. It is interesting that the associations between each of T1 PW-T, T1 PW-P and T1 and T2 SE persist when controlling for Conners-I, while the correlation between T2 PW-P, T2 PW-T and T1 SE or T3 SE are no longer significant when the effect of Conners-I is removed. This suggests that decoding and blending as foundational skills in learning to read, may affect self-efficacy in the earlier years of school when these skills are being developed however the same associations in the second and third year of school are not independent of inattentive behaviour.

Interestingly, Conners-I is the most widely mediating, as well as being the strongest mediator of the behaviour variables. Conners-H also mediates, but only in correlations where Conners-I also mediates, with Conners-I always being the stronger of the two. It seems in some cases the apparent correlation between self-efficacy and literacy was non-significant when accounting for the effect of Conners-I. This suggests that the role of inattention is important to the association between literacy and self-efficacy. The following correlations investigate the association between behaviour and both self-efficacy and literacy.

The association between T1 SE and T1 Conners-I remains statistically significant when you control for literacy. However, the association present between T1 SE and T1 Conners-T was mediated by every literacy variable (PW-P, PW-T, CTOPP-E, WRAT-S and Burt). The significant association between T1 SE and each of T1 Conners-T and T1 Conners-I which was present at T1 did not persist to T3, with neither T3 Conners-T or T3 Conners-I being related to T3 SE see Table 6. This would suggest that while inattention at T1 is associated with T1 self-efficacy independent of literacy levels, the same correlation is not present at T3. Self-efficacy is not correlated with behaviour at T3.

Table 6

Partial Correlations Between Self-Efficacy and Behaviour Controlling for Literacy

		T1 Conners-T	T1 Conners-I	T1 Conners-U	T1 Conners-H	T3 Conners-T	T3 Conners-I	T3 Conners-U	T3 Conners-H
T1 Self-efficacy	Zero order correlation	-.178*	-.264**	-.125	-.081	-.177*	-.263**	-.120	-.083
	Control variable: T1 WRAT-S	-.108	-.184*	-	-	-.103	-.180*	-	-
	Control variable: T1 PW-T	-.119	-.197**	-	-	-.118	-.196**	-	-
	Control variable: T1 PW-P	-.098	-.180*	-	-	-.096	-.178*	-	-
	Control variable: T1 Burt	-.099	-.178*	-	-	-.098	-.177*	-	-
	Control variable: T1 CTOPP-E	-.114	-.194**	-	-	-.112	-.193**	-	-
T3 Self-efficacy	Zero order correlation	-.051	-.099	-.019	-.033	-.100	-.146	-.031	-.066
	Control variable: no sig correlations	-	-	-	-	-	-	-	

Note. Cohen's (1988) guidelines include large correlations (r = .5 to 1.0), medium correlations (r = .30 to .49), and small correlations (r = .10 to .29). PW-T = Pseudoword reading total, PW-P = Pseudoword reading phoneme, CTOPP-E = CTOPP Elision, WRAT-S = WRAT Spelling, Burt = Burt word reading, Conners-T = Conners total score, Conners-I = inattention, Conners-U = moody uncooperative, Conners H = hyperactive. Boldface indicates medium correlations. Partial correlations were not carried out on nonsignificant correlations.

** Correlation is significant at the 0.01 level (two tailed) * Correlation is significant at the 0.05 level (two tailed).

T1 SE was negatively associated with T3 Conners-I and T3 Conners-T. Like the concurrent association, the association between T1 SE and T3 Conners-T was mediated by all literacy variables. This indicates there is no association between T1 SE and T3 Conners-T independent of literacy scores.

These findings further strengthen the earlier suggestion that Conners-T is not independently correlated with SE. It is only correlated because it includes the Conners-I subscale. The association between Conners-I and SE is larger than that between Conners-T and SE in all combinations, and where the correlation between SE and Conners-T is present,

it is mediated by every single literacy variable. It is clear then that Conners-I is the stronger association.

Interestingly, T1 Conners-I were not associated with T3 SE. So, while T1 SE is associated with both T1 Conners-I and T3 Conners-I, the opposite is not true. T1 Conners-I is only associated with T1 SE, not T3 SE. T3 SE is not correlated with either T1 Conners-I or T3 Conners-I. T3 Conners-I is also independent of T3 SE. Self-efficacy at T1 appears to play a role in inattentive behaviours at T3, even when T3 self-efficacy does not.

The associations between T1 literacy variables and the T1 behaviour scales were not mediated by SE, as shown in Table 7. This is true for Conners-U, Conners-I, Conners-H, and Conners-T. The only exception being T1 Conners-H and WRAT-S at T1 which was mediated by T1 SE. Partial correlations were also run between T3 behaviour scales and T2 and T3 literacy variables controlling for T3 SE. Self-efficacy mediates the association between T2 PW-T and T3 Conners-U. None of the other concurrent T2 and T3 correlations were mediated by self-efficacy. The across time partial correlations were also explored. The correlations between T1 behaviour scales and T2 and T3 literacy variables were all independent of SE, and self-efficacy did not mediate any of these correlations. The association between T1 CTOPP-E and T3 Conners-H is mediated by T3 SE. The rest of the associations between T1 literacy and each of the T3 behaviour scales are not mediated by self-efficacy.

Table 7

Partial Correlations Between Behaviour and Literacy Controlling for Self-Efficacy

		T1 PW-T	T1 PW-P	T1 CTOPP-E	T1 WRAT-S	T1 Burt	T2 PW-T	T2 PW-P	T2 CTOPP-E	T3 WRAT-S	T3 Burt
T1 Conners-T	Zero order correlation	-.259**	**-.319****	-.287**	-.282**	**-.334****	-.261**	**-.329****	**-.320****	**-.385****	**-.332****
	Control variable: T1 Self-efficacy	-.224**	-.285**	-.255**	-.246**	**-.302****	-.237**	**-.307****	-.288**	**-.358****	**-.301****
T1 Conners-I	Zero order correlation	**-.328****	**-.373****	**-.350****	**-.356****	**-.407****	**-.360****	**-.395****	**-.396****	**-.453****	**-.419****
	Control variable: T1 Self-efficacy	-.279**	**-.323****	**-.303****	**-.306****	**-.363****	**-.331****	**-.366****	**-.352****	**-.416****	**-.376****
T1 Conners-U	Zero order correlation	-.193**	-.238**	-.192**	-.193**	-.214**	-.146	-.232**	-.192*	-.218**	-.187*
	Control variable: T1 Self-efficacy	-.167*	-.213**	-.167*	-.166*	-.189*	-	-.215**	-.166*	-.195*	-.161*
T1 Conners-H	Zero order correlation	-.127	-.179*	-.166*	-.159*	-.200**	-.122	-.183*	-.192*	-.270**	-.205**
	Control variable: T1 Self-efficacy	-	-.163*	-.151*	-.143	-.186*	-	-.172*	-.177*	-.259**	-.191*
T3 Conners-T	Zero order correlation	-.260**	**-.320****	-.288**	-.296**	**-.333****	-.263**	**-.318****	**-.313****	**-.400****	**-.341****
	Control variable: T3 Self-efficacy	-.245**	**-.307****	-.273**	-.285**	**-.319****	-.252**	**-.307****	-.299**	**-.389****	**-.328****
T3 Conners-I	Zero order correlation	**-.328****	**-.374****	**-.349****	**-.369****	**-.404****	**-.361****	**-.388****	**-.392****	**-.467****	**-.426****
	Control variable: T3 Self-efficacy	**-.307****	**-.353****	**-.327****	**-.353****	**-.384****	**-.346****	**-.373****	**-.370****	**-.450****	**-.405****
T3 Conners-U	Zero order correlation	-.195*	-.241**	-.197*	-.211**	-.217**	-.154*	-.217**	-.186*	-.240**	-.202**
	Control variable: T3 Self-efficacy	-.193*	-.240**	-.196*	-.209**	-.217**	-.151	-.214**	-.185*	-.240**	-.203*
T3 Conners-H	Zero order correlation	-.126	-.177*	-.162*	-.169*	-.197**	-.125	-.180*	-.190*	-.280**	-.211**
	Control variable: T3 Self-efficacy	-	-.167*	-.151	-.160*	-.187*	-	-.171*	-.179*	-.273**	-.201*

Note. Cohen's (1988) guidelines include large correlations (r = .5 to 1.0), medium correlations (r = .30 to .49), and small correlations (r = .10 to .29). PW-T = Pseudoword reading total, PW-P = Pseudoword reading phoneme, CTOPP-E = CTOPP Elision, WRAT-S = WRAT Spelling, Burt = Burt word reading, Conners-T = Conners total score, Conners-I = inattention, Conners-U = moody uncooperative, Conners H = hyperactive. Boldface indicates medium correlations. Partial correlations were not carried out on nonsignificant correlations.

** Correlation is significant at the 0.01 level (two tailed) * Correlation is significant at the 0.05 level (two tailed).

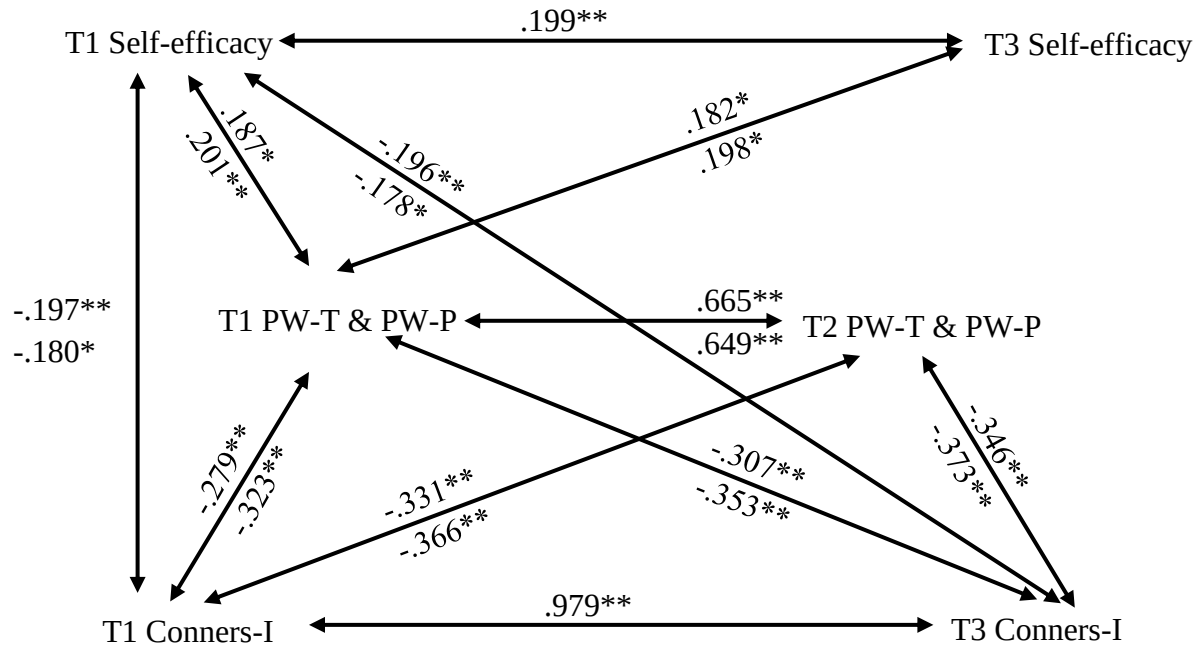
Correlations Across Time

PW-T and PW-P had very similar results and thus were included in the same graph, see Figure 3, as this leads to easier comparison between the two variables as they are measuring two similar skills. The correlations between PW-T, PW-P, SE, and Conners-I across time are shown in Figure 3. At T1, SE is correlated with PW-T and PW-P, meaning that higher SE scores at T1 are correlated with higher scores on T1 PW-T and PW-P, however T1 SE is not correlated with T2 PW-T and PW-P. T1 SE is also negatively correlated with T1 Conners-I, indicating that higher scores of SE at T1 are correlated with lower scores of Conners-I and thus less inattentive behaviours at the same time point. T1 SE was also negatively correlated with T3 Conners-I, indicating that high levels of SE at T1 were also associated with low scores on the Conners-I subscale at T3. T1 Conners-I was correlated with T1 PW-T and PW-P as well as T2 PW-T and PW-P. In terms of the later time point, the only concurrent association present is T2 PW-T and PW-P is correlated with T3 Conners-I.

Most notably, there is no association present between T3 SE and T2 PW-T and PW-P, nor is T1 SE correlated with T2 PW-T and PW-P. It would seem then that SE, PW-T and PW-P and Conners-I all correlate with each other at T1, but not so at T3. Conners-I and PW-T and PW-P are associated with each other across time, and these associations are stronger than those between SE and the other two variables in all time combinations. T1 SE is associated with T3 Conners-I and T1 PW-T and PW-P is associated with T3 SE.

Figure 3

The Association Between Self-Efficacy, PW-T/PW-P and Conners-I at T1, T2 and T3



Note. PW-T = Pseudoword reading total, PW-P = Pseudoword reading phoneme, Conners-I = inattention. The top number refers to PW-T and the bottom number refers to PW-P. Correlations shown are the partial correlations between each variable controlling for the third variable. This is excluding the T1 to T3 SE, T1 to T3 PW-T and PW-P and T1 to T3 Conners-I. These variables were not mediated by any other variable in this figure thus the zero order correlation is included. Only correlations that remain significant after mediation are included. Cohen's (1988) guidelines include large correlations (r = .5 to 1.0), medium correlations (r = .30 to .49), and small correlations (r = .10 to .29).

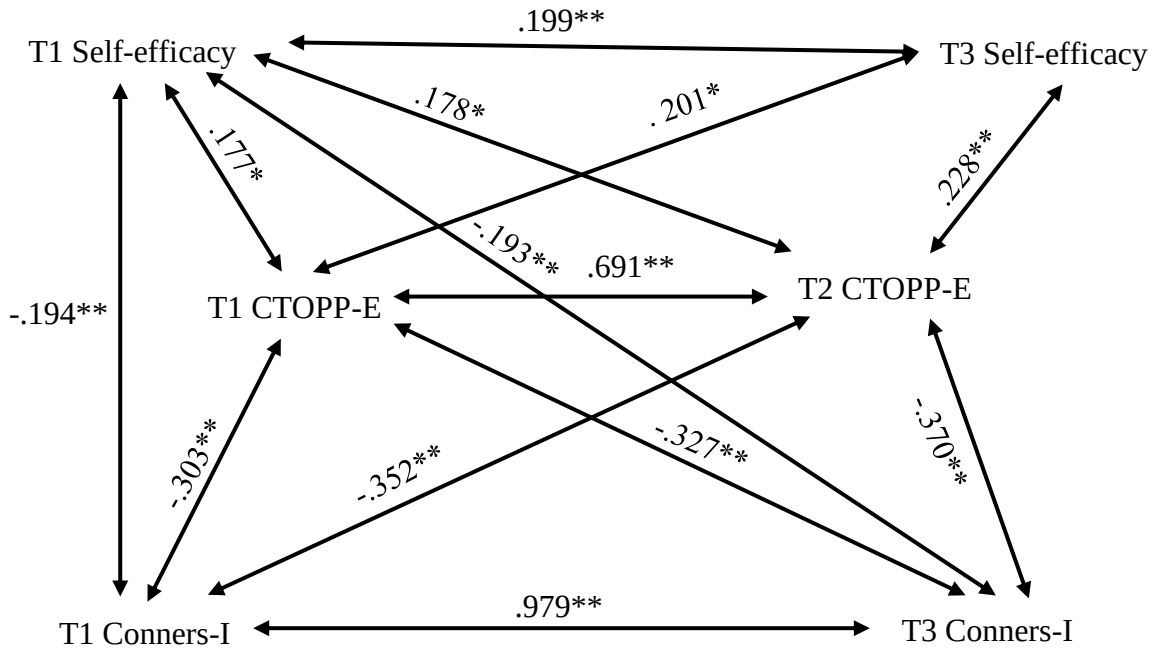
** Correlation is significant at the 0.01 level (two tailed) * Correlation is significant at the 0.05 level (two tailed).

The correlations between CTOPP-E, Self-efficacy, and Conners-I across time are shown in Figure 4. At T1 CTOPP-E, SE and Conners-I are all associated with each other. T1 CTOPP-E is also associated with T3 SE and T3 Conners-I, T1 SE is also associated with T3 Conners-I and T2 CTOPP-E. T1 Conners-I however, is only associated with T2 CTOPP-E. In terms of the later timepoint, T3 SE and T2 CTOPP-E are associated, T2 CTOPP-E is also associated with T3 Conners-I, but T3 SE is not associated with T3 Conners-I. T3 SE and T1 and T3 Conners-I are the only variables not significantly correlated. Higher levels of SE at T1 are associated with higher scores in T1 CTOPP-E and lower scores in T1 Conners-I (less inattentive behaviour). Higher scores in CTOPP-E at T1 are associated with higher T3 SE and lower T3 Conners-I, equally, higher scores on T1 SE are associated with higher scores on

T2 CTOPP-E and lower scores on T3 Conners-I. Lower scores on T1 Conners-I are associated with higher scores on T2 CTOPP-E.

Figure 4

The Association Between Self-Efficacy, CTOPP-E and Conners-I at T1, T2 and T3



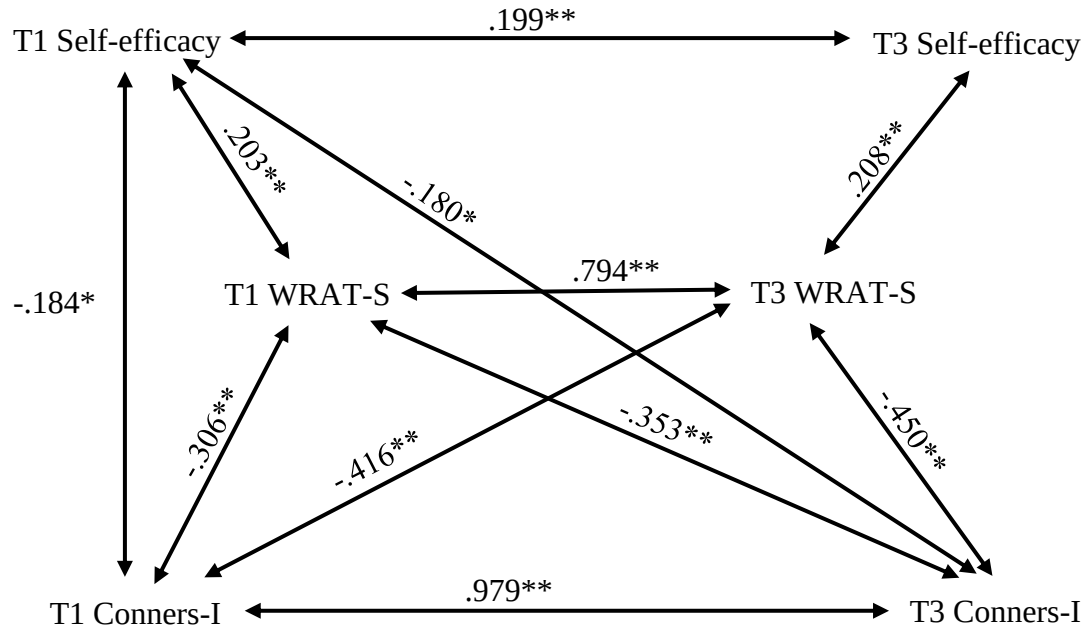
Note. CTOPP-E = CTOPP Elision, Conners-I = inattention. Correlations shown are the partial correlations between each variable controlling for the third variable. This is excluding the T1 to T3 SE, T1 to T2 CTOPP-E and T1 to T3 Conners-I. These variables were not mediated by any other variable in this figure thus the zero order correlation is included. Only correlations that remain significant after mediation are included. Cohen's (1988) guidelines include large correlations (r = .5 to 1.0), medium correlations (r = .30 to .49), and small correlations (r = .10 to .29).

** Correlation is significant at the 0.01 level (two tailed) * Correlation is significant at the 0.05 level (two tailed).

At T1 SE, WRAT-S and Conners-I are all correlated as shown in Figure 5. Higher SE score at T1 is correlated with lower score on Conners-I and higher scores on the WRAT-S. T1 SE and T1 WRAT-S are both correlated with T3 Conners-I. Higher scores on T1 SE, and higher scores on the T1 WRAT-S are both correlated with lower levels of T3 Conners-I. Equally T1 Conners-I is correlated with T3 WRAT-S. In terms of the T3 correlations, T3 WRAT-S is correlated with T3 SE and T3 Conners-I. Higher scores on the WRAT-S are correlated with higher levels of T3 SE and lower scores of T3 Conners-I. The correlations between T1 and T2 Conners-I and T1 and T3 WRAT-S are stronger than those between the

other two variables. It seems that the three variables are correlated at T1, but Conners-I is the only T1 variable still correlated with T3 WRAT. T1 SE is also correlated with T3 Conners-I. Interestingly, T1 WRAT-S and T3 SE are not correlated with each other, neither are T3 WRAT-S and T1 SE indicating self-efficay and spelling are not correlated across time. It would seem that Conners-I is the only variable correlated with WRAT-S or SE across time.

Figure 5
The Association Between Self-Efficacy, WRAT-S and Conners-I at T1 and T3



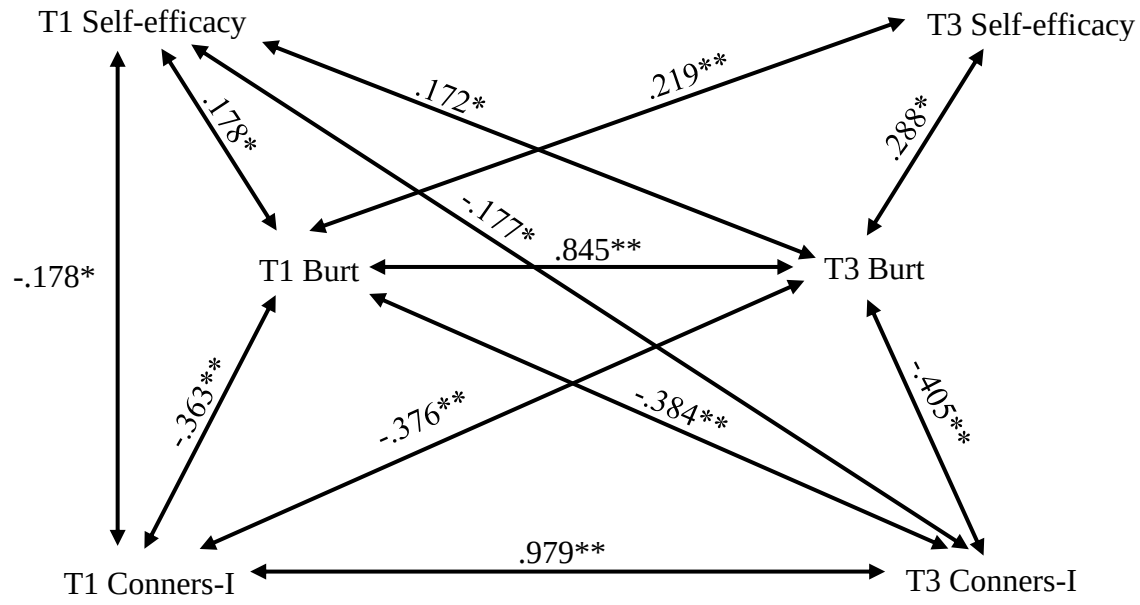
Note. WRAT-S = WRAT Spelling, Conners-I = inattention. Correlations shown are the partial correlations between each variable controlling for the third variable. This is excluding the T1 to T3 SE, T1 to WRAT-S and T1 to T3 Conners-I. These variables were not mediated by any other variable in this figure thus the zero order correlation is included. Only correlations that remain significant after mediation are included. Cohen's (1988) guidelines include large correlations (r = .5 to 1.0), medium correlations (r = .30 to .49), and small correlations (r = .10 to .29).
** Correlation is significant at the 0.01 level (two tailed) * Correlation is significant at the 0.05 level (two tailed).

At T1 SE, Burt and Conners-I are all correlated see Figure 6. Higher scores on the Burt at T1 are associated with higher SE scores and lower scores on T1 Conners-I (and therefore lower inattentive behaviour). At T3 Burt is correlated with both T3 Conners-I and T3 SE, however, T3 SE and T3 Conners-I are not correlated with each other. High scores on Burt at T3 are associated with higher T3 SE scores and lower T3 Conners-I scores. T3 SE

scores are not associated with inattentive behaviour at either time point. Across time T1 SE is correlated with T3 Burt and T3 Conners-I, T1 Burt is correlated with T3 SE and T3 Conners-I, while T1 Conners-I is corelated with T3 Burt, not T3 SE. High SE at T1 is associated with higher scores on T1 and T3 Burt and lower scores on T1 and T3 Conners-I. Higher scores on T1 Burt are associated with higher scores on T1 and T3 Conners-I and higher scores on T1 and T3 SE. Higher scores on inattentive behaviour at T1 is only associated with higher T1 and T3 Burt and T1 SE scores, not T3 SE scores. However, higher scores on T1 and T3 Burt are associated with higher scores on T3 SE. The strongest correlations are between T1 and T3 Conners-I and T1 and T3 Burt.

Figure 6

The Association Between Self-Efficacy, Burt and Conners-I at T1 and T3



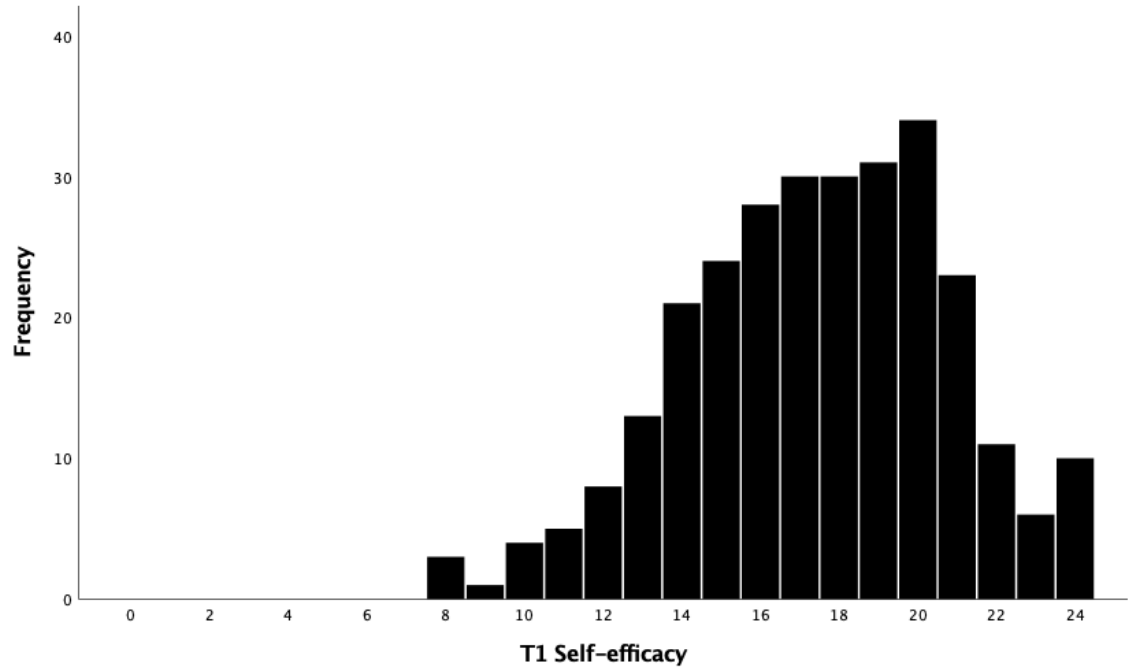
Note. Conners-I = inattention, Burt = Burt word reading. Correlations shown are the partial correlations between each variable controlling for the third variable. This is excluding T1 to T3 Burt and T1 to T3 Conners-I. These variables were not mediated by any other variable in this figure thus the zero order correlation is included. Only correlations that remain significant after mediation are included. The correlation between T1 SE and T3 SE was mediated by T3 Burt but was not mediated by any other variables. Cohen's (1988) guidelines include large correlations (r = .5 to 1.0), medium correlations (r = .30 to .49), and small correlations (r = .10 to .29).

** Correlation is significant at the 0.01 level (two tailed) * Correlation is significant at the 0.05 level (two tailed).

The Effect of Self-Efficacy at Year 1 on Literacy Development

The third aim of this research was to determine the influence of T1 SE on literacy development over time, for each individual literacy variable. To address the third question, the data set was examined to determine how to form groups of students according to their self-efficacy scores. The distribution of scores at T1 self-efficacy were examined and it would seem that the data was skewed with the scores clustered at the high end of the scale see Figure 7.

Figure 7
Bar Graph Showing the Distribution of Self-Efficacy at T1



Previous research has utilised a median split approach to divide self-efficacy data into high and low groups (Ouweneel et al., 2013). The split of continuous data into discrete groups allows the results to be easily interpretable and brings clarity to implications of the results which may only exist in one of these groups while not necessarily compromising statistical power and effect (Cassidy, 2015). This is important as a potentially adverse effect of low SE on literacy scores over time is suspected. As the correlations between self-efficacy and literacy were explored individually as continuous variables, the risk of misinterpretation

due to grouping was considered to be low and it was deemed appropriate to split the self-efficacy data into groups to explore the effect of these groups on literacy over time.

A median split approach was used to create discrete groups. In this grouping scores equal to or below the median would be assigned the low SE group (scores 0–18) and those above the median were assigned the high SE group (19–24 and above). Descriptive statistics were run on these groupings and are presented in Table 8. It was found there was a reasonably equal distribution of participants in each group with the low SE group being slightly larger with n = 167, 57.8% and 122, 42.2% in the high SE group.

Table 8
Demographic Information for Self-Efficacy Grouping

Self-efficacy	N	Percent	M
Low SE	167	57.8%	15.24
High SE	122	42.2%	20.63

Note. SE = Self-efficacy.

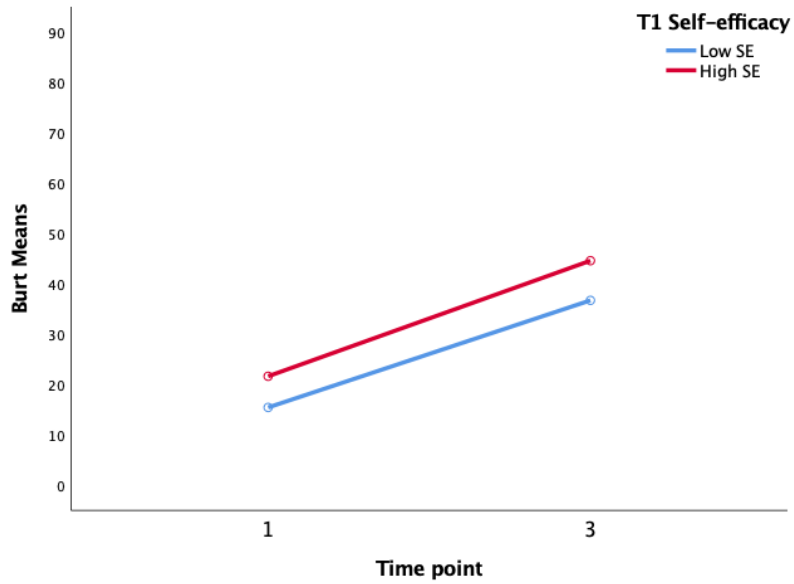
Mixed between-within subject analyses of variance were conducted for the SE group variable with two groups (low, and high SE) and the following literacy variables: Burt (T1 & T3), PW-T and PW-P (T1 & T2), CTOPP-E (T1 & T2) and WRAT-S (T1 & T3). This was done to determine if mean scores for self-efficacy group differed, as well as whether differences existed over the testing points. The analysis also describes whether there are interaction effect between these two variables. Each of these mixed between-within ANOVA indicated that there was a significant effect for time. This means that over time the students literacy scores improved without taking into account the different SE groupings. This is to be expected as literacy skills typically improve over time spent at school. Additionally, all analyses had a significant main effect for group, indicating that mean scores were different for each self-efficacy grouping when time is not considered. Those in the high self-efficacy group had generally higher scores on all literacy variables than the low self-efficacy group. An interaction effect indicated that these two effects interacted and affected each other. That

is, that SE group at T1 had an effect on literacy scores over time. The only variable with a significant interaction effect present was PW-P. PW-P score had a significant interaction between SE group at T1 and time, Wilks lambda = .977, F (1, 246) = 5.742, p = .017, η_p^2 = .023. This will be further investigated below using a suitable post hoc analysis. The post hoc analyses for the other literacy variables will also be reported to see if the graphs show any notable results.

The Burt post hoc is shown in Figure 8. While there was not a significant interaction effect, there was a slight difference in rate of scores on the Burt over time depending on SE group. The means of the SE groups at T1 showed a difference of 6 points (15.45 for the low SE group, 21.64 for the high SE group). By T3, that difference had increased to 8 points (36.71 and 44.6 respectively). The high SE group demonstrated slightly larger gains between T1 and T3 than the low SE group. However, this was not a statistically significant difference.

Figure 8

Changes in Burt Score Over Time by Self-Efficacy Grouping at T1



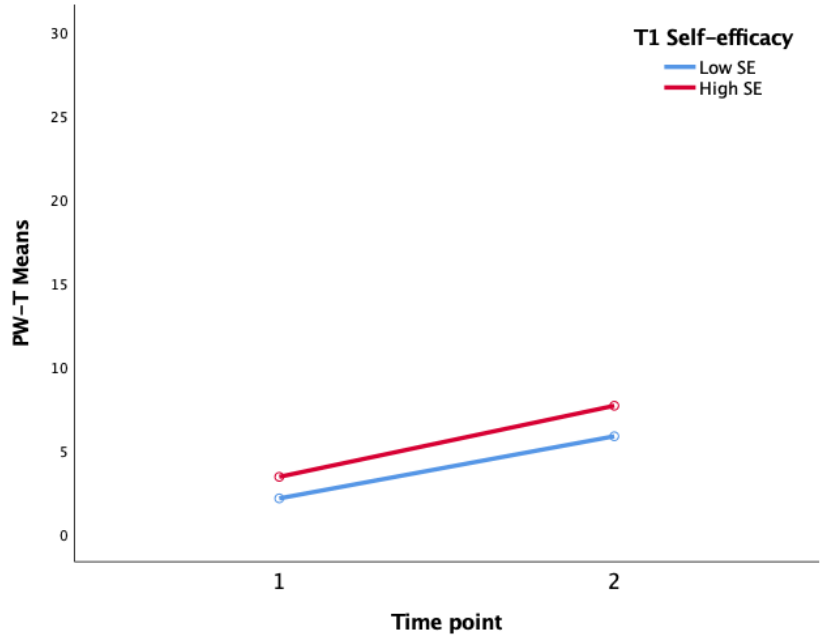
Note. SE = Self-efficacy, Burt = Burt word reading.

The PW-T post hoc is shown in Figure 9. There was no significant interaction between SE group at T1 and time for PW-T. The PW-T post hoc showed a similar increase in

scores over time for the low and high SE group. Both high and low SE groups demonstrated large gains between the testing periods and both groups appear to make gains in achievement at the same rate. There is a small difference in the means at T1, a difference of about 4 points (3.12 for the low group and 6.58 for the high group). At T3, that difference is consistent at 4 points (10.53 and 14.04 respectively).

Figure 9

Changes in PW-T Score Over Time by Self-Efficacy Grouping at T1

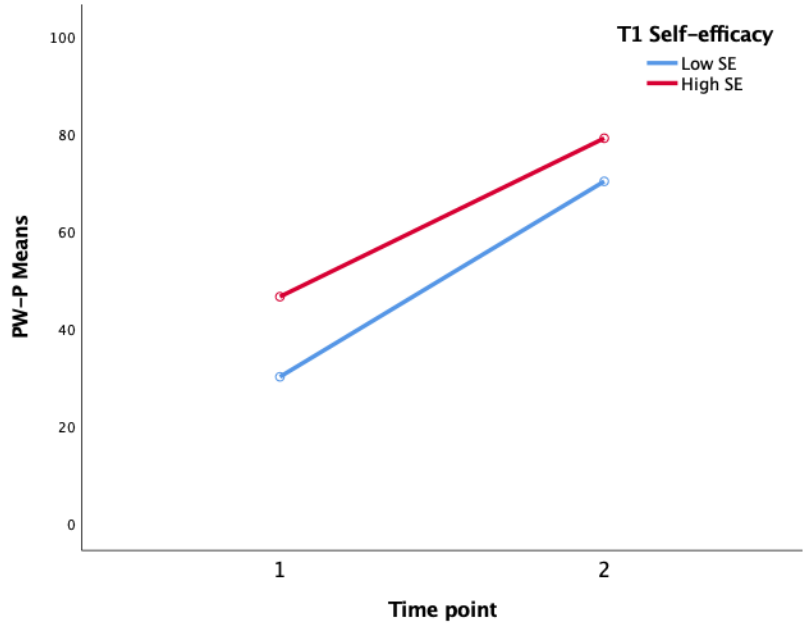


Note. SE = Self-efficacy, PW-T = Pseudoword reading total.

The PW-P post hoc is shown in Figure 10. There was a significant interaction between SE group at T1 and time, Wilks lambda = .977, F (1, 246) = 5.742, p = .017, η_p^2= .023. There is a larger difference in the means at T1, a difference of 16 points (30.08 for the low group, 46.55 for the high group). By T3, that difference had decreased to just 9 points (70.25 and 79.11 respectively). The low SE group demonstrated large gains between the testing periods, while the high SE group also gained in achievement, but less so than the low SE group.

Figure 10

Changes in PW-P Score Over Time by Self-Efficacy Grouping at T1

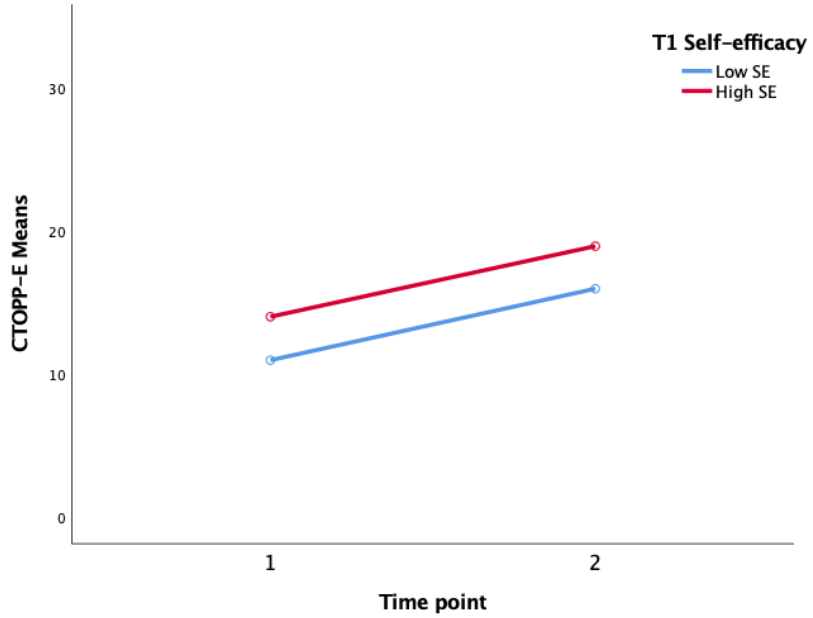


Note. SE = Self-efficacy, PW-P = Pseudoword reading phoneme.

The CTOPP-E post hoc is shown in Figure 11. There was no significant interaction between SE group at T1 and time for CTOPP-E. The CTOPP-E post hoc showed a similar increase in scores over time for the low and high SE group. There is a small difference in the means at T1, a difference of about 4 points (3.12 for the low group, 6.58 for the high group). At T3, that difference is consistent at 4 points (10.53 and 14.04 respectively). Both high and low SE groups demonstrated large gains between the testing periods, and both groups appear to make gains in achievement at the same rate.

Figure 11

Changes in CTOPP-E Score Over Time by Self-Efficacy Grouping at T1

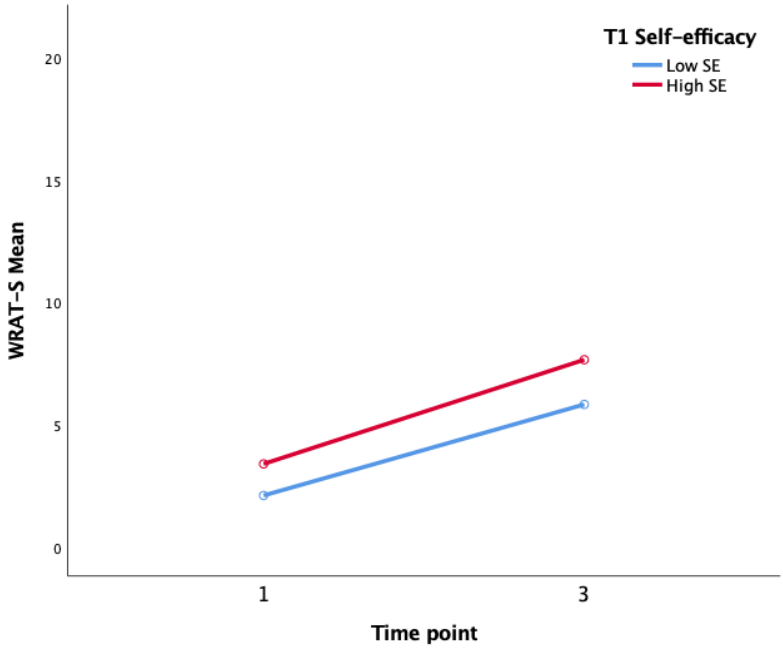


Note. SE = Self-efficacy, CTOPP-E = CTOPP Elision.

The WRAT-S post hoc is shown in Figure 12. While there was not a significant interaction effect, there was a slight difference in rate of scores on the WRAT-S over time depending on SE group. There is a small difference in the means at T1, a difference of about 1 point (2.12 for the low group, 3.41 for the high group). By T3, that difference had increased to almost 2 points (5.84 and 7.67 respectively). The high SE group demonstrated large gains between the testing periods, while the low SE group also demonstrated gains in achievement over time, but to a lesser extent than the high SE group.

Figure 12

Changes in WRAT-S Score Over Time by Self-Efficacy Grouping at T1



Note. SE = Self-efficacy, WRAT-S = WRAT-Spelling.

Summary

This chapter began by presenting the findings of Pearson's correlations investigating the association between self-efficacy, literacy, and behaviour in children over the first 3 years of schooling, followed by partial correlations, checking for mediation by the third variable. Support was found for the first hypothesis which investigated the association between self-efficacy, literacy, and behaviour. A weak association was found between self-efficacy and literacy over the first 3 years of school. For the most part, this was not mediated by behaviour. A medium strength association was found between literacy and inattentive behaviour over the first 3 years, which was not mediated by self-efficacy. While there was a small association between T1 self-efficacy and T1 and T3 inattention, it was not substantial enough to say self-efficacy and behaviour are generally associated. It was identified that inattentive behaviour was the most strongly correlated with all variables, above hyperactivity,

moody uncooperative and the total behaviour variable. This suggests that children with more inattentive behaviour are likely to also have low literacy and low self-efficacy.

Mixed between within analyses were performed to investigate the effect of self-efficacy at the end of Year 1 on literacy development. Results demonstrated partial support for the third hypothesis, which stated that self-efficacy at the end of Year 1 would impact literacy development and that those with low self-efficacy at the end of Year 1 would become subject to a Matthew effect. It was found that students with high self-efficacy at the end of Year 1 had higher literacy scores throughout the course of the study, while those with low self-efficacy had lower literacy. However, evidence for a Matthew effect was not found. Those with low self-efficacy did not fall further and further behind the high self-efficacy group in literacy development, at least not substantially. In fact, for PW-P the low self-efficacy group was closing the gap between high and low, showing a statistically significant interaction effect between time and SE grouping. These results are discussed in the following chapter.

Chapter 5: Discussion

This research aimed to explore the relationship between literacy, self-efficacy, and behaviour in children in Aotearoa New Zealand across their first 3 years of schooling. Self-efficacy and behaviour variables were measured at the end of Year 1 and the middle of Year 3, while literacy was measured at the end of Year 1 and either the end of Year 2 or the middle of Year 3.

This study used data from the Early Literacy Project to conduct a secondary analysis. The first hypothesis predicted that self-efficacy would be associated with literacy, and that literacy would be associated with behaviour, but that self-efficacy would not be associated with behaviour. The first hypothesis was supported by the consistent associations identified between literacy and self-efficacy, and literacy and behaviour across the first 3 years of school. Second, it was hypothesised that the expected correlation between self-efficacy and literacy would not be mediated by behaviour, and the correlation between literacy and behaviour would not be mediated by self-efficacy. This hypothesis was largely supported in terms of the association between literacy and self-efficacy. Inattention was found to mediate some of the associations between self-efficacy and literacy. The associations found between behaviour and literacy were mediated by self-efficacy, however the association between inattention and literacy was not mediated as predicted. Thirdly, it was hypothesised that the development of literacy abilities over time would be dependent on self-efficacy at Year 1 and those with low self-efficacy would become subject to a Matthew effect. This was not supported by the findings, which found a difference between the low self-efficacy group and high self-efficacy group, but this difference was maintained over time; no Matthew effect was observed.

Literacy and Inattention/Behaviour

Evidence of a significant association between literacy and behaviour, independent of self-efficacy scores was found across all 3 years of schooling. These findings support current literature, which has previously identified a relationship between literacy and behaviour in the classroom (Lee & Jonson-Reid, 2016). Lee and Jonson-Reid (2016) also found classroom behaviour to be a significant predictor of reading achievement with children in their first year of school through to their third year of school.

Although poor the general behaviour measure was found to be related to poorer reading outcomes across time, inattention demonstrated the strongest and most consistent relationship with reading and spelling outcomes. Findings indicated that those with less inattentive behaviours are likely to be better readers and spellers, and those with high levels of inattentive behaviour are likely to be poorer readers and spellers. This is may be due to the fact that learning to read requires repeated practice and sustained attention (Dittman, 2016). As such, inattentive behaviour can inhibit a child's ability to learn to read during formal reading instruction (Dally, 2006). This supports previous research that found an association between literacy and inattentive behaviour (Dittman, 2016; Prochnow et al., 2013; Sims & Lonigan, 2013).

The current study found that inattention is more highly and reliably correlated with literacy skills than other behaviours measured, including hyperactivity and moody uncooperative behaviour. This finding is supported within research, which has found in comparison to hyperactivity, inattention is a more reliable predictor of literacy (Ebejer et al., 2010; McGee et al., 2002; Sims & Lonigan, 2013). This difference has been attributed to the differing potential of each of these behaviours to interfere with learning (Sims & Lonigan, 2013). Linnenbrink and Pintrich (2003) describe two types of engagement in learning, behavioural and cognitive engagement. Behavioural engagement includes observable

behaviours such as being squirmy, restless or defiant. It is normally easy to tell if a child is behaviourally engaged as most behaviours are overt and obvious. Cognitive engagement is less easily identified. Children that are cognitively engaged are attending to the lesson, they are thinking about or completing the work. In this study, inattentive children were characterised within the CTRS-R scale used in this study (Conners et al., 1998) as having short attention spans, being easily distracted, failing to follow instructions and finish schoolwork, all of which characterise cognitive disengagement which interfers with learning directly. Hyperactive children were characterised within the CTRS-R as restless, squirmy, unable to stay still and having difficulty playing quietly. Moody uncooperative children were pouty and sulky, had moods that change quickly, and were defiant. Children engaging in moody uncooperative and hyperactive behaviours are behaviourally disengaged but may not necessarily be congitively disengaged. While these behaviours can interfere with learning, they do not necessarily exclude a child from learning to read. Inattentive behaviours are far more likely to preclude children from learning to read as they directly interfere with learning through cognitive disengagement.

Additionally, behavioural disengagement such as hyperactive, and moody uncooperative behaviours are much more likely to disrupt learning at the whole classroom level, while inattentive behaviours are often not obvious within the class (Linnenbrink & Pintrich, 2003; Sun & Shek, 2012). A child who is inattentive may be more difficult to identify within the general context of the classroom. Thus, teachers may identify and address hyperactive and moody uncooperative behaviours, thereby limiting their impact on learning to read, while inattentive behaviours may go undetected while having a larger negative effect on learning to read.

The current findings support a reciprocal relationship between having difficulty developing literacy skills and higher levels of inattentive behaviour. There are multiple

hypotheses surrounding the nature of the relationship between inattention and low literacy. One hypothesis is that there is a developmental progression from inattentiveness to struggling with reading (Dally, 2006). As discussed previously a child who struggles with inattention is more likely to have difficulty learning to read due to the sustained attention required for the task. However, the opposite direction has also argued where literacy difficulties may lead to the development of inattentive behaviours (McGee et al., 2002). A child who has trouble developing literacy skills, is more likely to engage in inattentive behaviours because they are experiencing difficulties with the task. It has also been suggested that a reciprocal causal relationship exists between behaviour difficulties and struggling to develop literacy skills (Spira & Fischel, 2005; Stanovich, 1986). The current research found that inattention at the end of Year 1 significantly correlates with literacy after 2 years of school. Literacy at the end of Year 1 also significantly correlates with inattention in the third year of school. While the correlation is slightly larger in favour of inattention influencing literacy, the two correlations are similar enough to suggest a reciprocal effect, meaning that children with low attentional behaviours at Year 1 are likely to struggle with literacy later in school, thereby leading to additional inattentive behaivour due to difficulties associated with literacy development. The current research only provides evidence for the first 3 years of school, although a reciprocal relationship between literacy achievement and inattentive behaviours has been identified in longitudinal research with new entrants through to 7 years at school (Prochnow et al., 2013). While research by Dittman (2016) did not support a reciprocal effect, their study was conducted with a small sample size and limited diversity, significant limitations which do not apply to the current study.

The current research investigates the link between literacy and inattention during school, however it is possible that these difficulties begin to develop prior to school entry. Some research suggests that the link between inattentive behaviours and reading related skills

is present before school entry where most formal reading instruction commences (Sims & Lonigan, 2013). Sims and Lonigan (2013) investigated the relationship between emergent literacy and inattentive and hyperactive impulsive behaivours in preschool children and found that inattention was correlated with emergent literacy skills. Findings indicated that the relationship between inattention and emergent literacy skills was present prior to beginning school, when reading instruction traditionally commences. However, while beginning school is the commencement of formal and explicit reading instruction for most children, children may encounter literacy instruction in some form prior to school. These experiences, positive or negative, may influence their attentive behaviours and their ability to develop literacy skills.

The current research found inattention to be related to all literacy variables explored, including both process and outcome measures, however the most strongly correlated were outcome measures that included real word reading in Year 1 and spelling in Year 3. This is in contrast to previous research, which has found evidence for an association between inattention and the process measure phonological processing (Dally, 2006; Ebejer et al., 2010). Phonological skills are early literacy skills that impact later learning, thus stronger correlations between phonological skills and inattention may be expected earlier in schooling, while reading and spelling may be more strongly related to inattention later on. The current research found an association between phonological processing and inattention at the end of Year 1 however, this was not the strongest correlation found. The early disruption of the development of phonoligical skills may have a detrimental impact on reading over time. Ebejer et al. (2010) and Dally (2006) found inattention to be predictive of phonological awareness, which is a form of phonological processing. However Dittman (2016) found that inattention at school entry did not predict phonological awareness at the end of first or second grade. Dittman (2016) suggested this was because the effect of inattention on phonological

processing is small and time limited. However, the current research found that inattention at Year 1 was associated with phonological processing at the end of Year 2 after controlling for self-efficacy. The strength of the correlation was comparable to past research (Dally, 2006; Ebejer et al., 2010), suggesting that the effect of inattention on phonological processing is maintained throughout the early years of school and is not as time limited as Dittman (2016) suggested.

It has been suggested that the difference in the strength of the correlation between inattention and phonological processing compared to that between inattention and real word reading and spelling may be due to how the different skills are acquired. Sims and Lonigan (2013) found inattention was more strongly correlated with code related emergent literacy skills, such as phonological awareness and print knowledge, compared to meaning related skills such as vocabulary. They suggested that this is due to how these skills are learned because code based skills, such as phonological awareness, are learnt during structured group learning and individual activities (Sims & Lonigan, 2013). Thus, attention difficulties may be more disruptive to this learning in comparison to more implicit learning, such as vocabulary. Learning code related skills may be more negatively impacted by inattentive behaviour than language development (Sims & Lonigan, 2013). This may be why the current research found stronger correlations between inattention and word reading in Year 1 and spelling in Year 3, as these skills are not learnt implicitly, but are code related and typically explicitly taught, they are therefore more vulnerable to disruption by inattentive behaviours.

The current study supports previous research that found inattention influences reading development over the first few years at school. Understanding the influence of inattention on future reading is crucial, as reading underpins access to the wider curriculum and academic achievement in general (Dittman, 2016). Overall, children who struggle to learn to read are

likely to experience a carry-over effect into other areas of academic learning due to lower reading ability (Stanovich, 1986).

The Conners behaviour checklist, from which these behaviour scores are derived, relies on the teacher reporting on the behaviours they observe in children in their class which may be affected by the teacher's expectations of the child. It has been found that teachers' perceptions about the children's behaviour might not accurately reflect what is happening (Lane et al., 2006; MacLure et al., 2012). Teachers may interpret students' responses to learning as reflecting low engagement and inattentive behaviour when, in fact, they are struggling with learning to read. It may be that teachers do not observe the difficulty with reading, but instead believe that children are being inattentive in class and that is why they are not learning. Teachers' perceptions are important as teachers may change their teaching practice in line with their expectations and give different students different opportunities to learn based on these perceptions (Rubie-Davies, 2006). When teachers have low expectations of student achievement, they are more likely to give these students fewer cognitively demanding tasks, less feedback, as well as being likely to ask more closed questions of them and teach them at a slower pace (Good & Weinstein, 1986; Rubie-Davies, 2007). In contrast, students for whom teachers have high expectation are given more challenging learning opportunities, are asked more open-ended questions, and are taught faster using a facilitative approach that encourages student autonomy (Page & Rosenthal, 1990; Rubie-Davies et al., 2007; Weinstein, 2002).

Teacher expectations are also found to influence other factors including engagement and self-perceptions (Timmermans et al., 2016). Teachers' high expectations of students' achievement tends to lead to students having higher engagement and self-confidence (Rubie-Davies, 2010). Teachers' low expectations tend to lead to low engagement and low self-confidence. Low engagement may also be characterised as inattentive behaviour, while low

self-confidence may also lead to unwillingness to answer questions and participate in class for fear of being wrong, which is also characterised as low self-efficacy. Thus, inattentive children may have low expectations placed on them and therefore receive less opportunities to learn, reducing their ability to achieve.

Literacy and Self-Efficacy

A significant association was found between literacy and self-efficacy, independent of inattention over 3 years of school. This supports previous findings within literature of an association between self-efficacy and literacy (Lee & Jonson-Reid, 2016; Liew et al., 2008; Multon et al., 1991; Talsma et al., 2018; Usher et al., 2019; Wilson & Trainin, 2007). However, the current study found that the association between literacy and self-efficacy was weaker than the association between inattention and literacy. Nonetheless, this suggests that students who have higher literacy scores are also likely to have higher self-efficacy. This is likely due to children with higher self-efficacy and belief in their ability to succeed at a task, putting in more effort and persisting longer than their peers with lower self-efficacy (Bandura, 1997; Pajares & Schunk, 2001; Peura et al., 2019). A low number of the small associations between self-efficacy and literacy were found to be mediated by inattentive behaviour, namely spelling, pseudoword reading, and pseudoword phoneme decoding. This suggests that the apparent association between literacy and self-efficacy, in a few cases, is explained by behaviour, which supports previous research which has found behaviour to mediate the relationship between self-efficacy and academic achievement (Bandura et al., 1996; Linnenbrink & Pintrich, 2003). However, most of the associations between self-efficacy and literacy were not mediated by behaviour showing that, for the most part, those with higher literacy skills are likely to have higher self-efficacy regardless of inattentive behaviours.

The finding of an association between self-efficacy and literacy suggests that self-efficacy development is critical to facilitating learning. Those with low self-efficacy are likely to achieve lower literacy levels. This may be because those with low self-efficacy and low literacy achievement are less likely to seek help, whereas research has found that children with high self-efficacy are more likely to ask for help (Ryan and Pintrich (1998). Furthermore, for children to develop and learn effectively, their self-efficacy needs to be calibrated to their actual ability (Linnenbrink & Pintrich, 2003). The zone of proximal development describes a learner attempting tasks just above the current level of ability to be able to develop learning effectively (Vygotskii & Cole, 1978). The same can be applied to self-efficacy. A child who underestimates their ability, thus having low self-efficacy, may not attempt a task that is within their skill range. This limits their ability to develop their learning over time. However, if students overestimate their ability, thereby having too high a level of self-efficacy, they may not pay attention to a lesson as they already believe themselves capable of achieving the task. This may cause them struggle later when they attempt the task due to missing critical information (Linnenbrink & Pintrich, 2003).

As well as affecting learning through the differential opportunities offered to students, teachers' expectations also have a significant impact the development of self-efficacy within a child. Teachers change their behaviour and teaching instruction based on how capable they believe the child to be (Rubie-Davies, 2006). Children are aware of their teachers' perceptions of their ability, which impacts their self-confidence, their engagement in class and their willingness to attempt and persist at more difficult problems, all of which influences the development of self-efficacy (Rubie-Davies, 2010; Weinstein, 2002). Thus children who have low expectations placed on them tend to have lower achievement outcomes than children who have high expectations placed on them, regardless of prior achievement level (Rubie-Davies, 2006; Rubie-Davies et al., 2003).

In the current study, the literacy skills most highly associated with self-efficacy in the first year at school were pseudoword phoneme decoding and spelling. In the third year of school, only one medium correlation was found between self-efficacy and word reading, which was weakened when controlling for inattentive behaviour. This suggests that in the first year of school self-efficacy is most closely tied to phoneme decoding in pseudowords and spelling perhaps because decoding at the level of phonemes and spelling are the skills that are emphasised at the beginning of learning to read and write. Initially, when learning to read and write, children are taught to sound out words. This requires developing phonics based knowledge as the foundation of reading and spelling as described in the cognitive foundations model (Tunmer & Hoover, 2014). Children need basic letter-sound knowledge to know what sound belongs to each letter. To read a word, children break a word down by letter-sound correspondences, then blend the segmented word together to read the whole word. Equally, writing in the first year of school involves children speaking out loud the word they want to write, listening to the sounds they hear and writing down the corresponding letter. Thus, spelling and pseudoword phoneme decoding are the focus of early literacy development which is likely why they are the skill most closely linked to self-efficacy in Year 1.

By the third year of school however, self-efficacy was most closely linked to whole word reading. This is likely because by the third year of school children have developed the foundational knowledge of learning to read and are using these skills to read novel words. At this point, the whole word reading measure encompasses the variance of the process variables which measure specific foundational literacy skills. As a result, whole word reading is most closely tied to their self-efficacy. In addition, word reading in the first year of school is also associated with self-efficacy in the third year of school. This may be due to ability to read whole words in Year 1 leading to higher self-efficacy in the third year of school. However, it

was also found that word reading at the end of Year 1 was associated with each of the reading measures at Year 3 these being pseudoword reading, pseudoword phoneme decoding, spelling and phonological processing. These associations between Year 1 word reading and Year 3 reading measures were stronger than each of these measures' associations with themselves at Year 1. It may be that rather than word reading leading to higher self-efficacy in Year three, word reading in the first year is indicative of the other literacy skills at Year 3 (pseudoword reading, pseudoword phoneme decoding, spelling and phonological processing) which are then themselves associated with self-efficacy in the third year of school.

The finding of an association between self-efficacy and literacy in the first year of school adds to the research demonstrating that children are able to develop self-efficacy early in school (Chapman & Tunmer, 2003; Lee & Jonson-Reid, 2016). Furthermore, the current research supports the notion that self-efficacy is domain specific, in this case reading, from a young age. This finding is supported in the literature, which has found children can develop self-efficacy within the first year of school (Lee & Jonson-Reid, 2016). In fact, research has identified that self-perceptions develop even earlier, suggesting that self-efficacy may also develop earlier than has been measured to this point. Chapman and Tunmer (2003) found that self-concept develops 6–8 weeks into school. While reading self-efficacy and self-concept are not the same, they have been found to be correlated, particularly when value is placed on an activity (Bandura, 1997; Ferla et al., 2009) suggesting self-efficacy may also develop earlier in school than research has investigated.

There are differing theories on the nature and direction of the relationship between self-efficacy and literacy. The first involves a unidirectional influence, where either higher self-efficacy leads to better literacy ability, or higher literacy leads to self-efficacy development. Self-efficacy is thought to lead to better literacy skills by increasing persistence and engagement in a task leading to a higher likelihood of success (Pajares & Schunk, 2001).

However, literacy skills may build self-efficacy as self-efficacy is primarily developed through mastery, meaning that past experiences of literacy influence the development of self-efficacy (Bandura, 1977). It is also hypothesised that self-efficacy and literacy influence each other in a reciprocal relationship. This is known as a feedback loop where self-efficacy effects achievement in a reciprocal manner (Bandura, 1997). There is limited research that has looked at this notion specifically (Lee & Jonson-Reid, 2016; Liew et al., 2008). Talsma et al. (2018) conducted a meta-analyses of self-efficacy research to determine the direction of the relationship. They found that in adults performance had a stronger effect on later self-efficacy, while self-efficacy had a much weaker, but still statistically significant, effect on later performance, thus supporting a reciprocal effect. However, this was not found for children. Talsma et al. (2018) found a unidirectional relationship in children where academic performance was related to later self-efficacy, but self-efficacy was not statistically significantly related to later performance. The current findings were similar to the findings of Talsma et al. (2018) in adults. Evidence supported a reciprocal effect where both self-efficacy and performance had a statistically significant positive association with each other at a later time point. This suggests that children construct their own environment in such a way to facilitate learning based on their self-efficacy and that self-efficacy is influenced by past literacy experiences and achievement. However in the current research, when removing the effect of inattentive behaviour, self-efficacy in Year 1 ceased to have a significant association with three out of five of the literacy measures at Year 3, namely pseudoword reading, phoneme decoding, and spelling. This suggests that the evidence for a reciprocal relationship between self-efficacy and literacy in young children may be more strongly related to specific literacy skills.

The current study explored the presence of a Matthew effect by comparing the literacy development of those with high self-efficacy at the end of Year 1 with those with low

self-efficacy. It was found that students with high self-efficacy at the end of Year 1 had generally higher literacy scores over the first 3 years in school, and those with low self-efficacy had lower literacy scores. However, the literacy abilities of both groups developed at the same rate, with the low self-efficacy group consistently behind at each time point, which failed to support a Matthew effect. In fact, the low self-efficacy group had better development in pseudoword phoneme decoding than the high self-efficacy group, narrowing the gap between the two groups over the first 3 years of school.

For the most part the low self-efficacy group were behind in literacy at the end of Year 1 and stayed behind over the first 3 years of school. This may be due to them arriving at school with less emergent literacy skills due to a myriad of potential reasons (Korat et al., 2007). Children who come to school with fewer emergent literacy skills tend to take longer to learn how to read (Arrow & McLachlan, 2014; Cabell et al., 2008). It is likely that these students came to school with less emergent literacy skills, struggled to develop literacy skills and as a result, have low self-efficacy at the end of Year 1. It may be that low self-efficacy, or lower literacy skills, or a combination of both may lead to the persistence of lower literacy scores over time compared to their peers with high self-efficacy at the end of Year 1.

Despite these potentially negative factors, children with low self-efficacy after 1 year of school did not fall further and further behind as expected. However, for the most part they were not catching up, except in the case of pseudoword phoneme decoding. This is interesting as the Matthew effect suggests that those with poor literacy scores would fall further and further behind (Peura et al., 2019; Stanovich, 1986). Perhaps these students received enough support that those with low self-efficacy did not experience a Matthew effect. This finding raises the question of whether achievement could be boosted by developing self-efficacy early in schooling, as well as through explicit teaching of literacy skills early in school years as shown in Denston (2016) with 8 year olds. If the students who

are likely to struggle are identified early, these risk factors, such as low self-efficacy and less emergent literacy skills, can be addressed and the risk of a Matthew effect mitigated.

Students with low self-efficacy at the end of Year 1 developed pseudoword phoneme decoding skill at a faster rate than the high self-efficacy group at Year 1. This acceleration in learning may have been because these children had less skills in the first place compared to those with high self-efficacy as shown by correlational analyses. These students may have been still trying to develop decoding skills while the decoding skills of the children with high self-efficacy at Year 1 had already plateaued.

Self-Efficacy and Inattention/Behaviour

Self-efficacy was not associated with behaviour, independent of literacy, across the first 3 years of school. The lack of association between self-efficacy and behaviour is found in literature by Lee and Jonson-Reid (2016) in first through third graders. However, while the current research found no association between general behaviour and self-efficacy, a significant association was found between self-efficacy at the end of Year 1 and inattention at the end of Year 1, and between self-efficacy at the end of Year 1 and inattention in the third year of school. High self-efficacy in the first year of school is likely to be associated with less inattentive behaviour at that time point and persisting through to the third year of school. There is limited research around self-efficacy and inattentive behaviour specifically, so it is difficult to say whether the finding of an association between self-efficacy and inattention is supported by research. However, Multon et al. (1991) found a positive association between self-efficacy and persistent behaviours. While this is not inattention, persistence was categorised as time spent on task and number of items completed in a task which is measuring attentive behaviours, the inverse of inattention, lending support to the conclusion that attentiveness and thus the opposing inattentiveness, is associated with self-efficacy.

This correltaion found between self-efficacy and inattention is likely due to similar reasons that inattention was most consistently related with reading outcomes. Those that are highly efficacious about their reading and judge themselves as capable of success are likely to persist longer and engage in reading tasks, fostering attentive behaviours (Pajares & Schunk, 2001), while those that have low self-efficacy tend to find it more difficult to engage, which is demonstrated through higher levels of inattentive behaviours (Chapman & Tunmer, 2003).

The current findings suggest that high self-efficacy may act as a protective factor against developing inattentive behaviours. This research found those with high self-efficacy early in school are likely to have less inattentive behaviours in their third year. However, inattentive behaviour did not have the same effect on self-efficacy long term. No association was found between inattentive behaviour after 1 year and self-efficacy after 3 years of school. Self-efficacy has been identified as a protective factor for regulating human functioning and emotional wellbeing through cognitive motivational, affective, and selective processes (Hamill, 2003). Bandura (1993) suggests that a student's belief in their ability to regulate their own learning and successfully learn concepts will impact their achievement by influencing their levels of motivation and goals. While a lack of research exists to prove this theory, it suggests that children with high self-efficacy early in school are more likely to regulate a negative experience with learning to read, recognise they are in control of their achievement, and thus are less likely to develop inattentive behaviours.

The identified association between self-efficacy and inattention after 1 year of school had disappeared by the third year of schooling. This is not unexpected, as there are very limited findings of a relationship between inattention and self-efficacy within research (Multon et al., 1991), with some finding no relationship at all (Prochnow et al., 2013). In addition, those with low self-efficacy in reading and likely low literacy ability may choose to

value other subjects and skills, caring less about reading as a self-protective mechanism (Eccles & Wigfield, 1995) weakening the relationship between self-efficacy and inattentive behaviour, leading to a lack of relationship in Year 3. The value placed on a task depends on the perceived importance of a task to one's identity and whether a child expects to experience success. When children feel efficacious in a task they are likely to place value on that task (Eccles & Wigfield, 1995). Feeling efficacious during a task is related to more time spent on that task and engagement over time, indicating that low inattentive behaviour may be related to tasks where students' have high self-efficacy and value the task (Jacobs & Eccles, 2000; Wigfield, 1994). Children with low self-efficacy may have lost the desire to build their literacy by Year 3, leading to a lack of relationship between self-efficacy and inattentive behaviour.

Implications

Early identification and effective intervention and instruction is clearly needed in order to mitigate the risk of an ongoing reciprocal relationship between literacy difficulties and high inattention, which tends to also be associated with low self-efficacy (Tunmer et al., 2003). Low self-efficacy, low literacy skills, and inattentive behaviour that is undetected and unsupported may have a compounding negative impact on a child's learning over time. The earlier that these children are identified, the earlier support can begin.

In the current study, children with better literacy skills in Year 1 tended to have better self-efficacy and less inattentive behaviour across the first 3 years at school. This is likely because children with less emergent literacy skills at school entry are more likely struggle to develop phonological awareness and other foundational literacy skills implicitly leading to the development of inattentive behaviour. Children with low emergent literacy skills at school entry should be taught through explicit instruction. Children with low early literacy skills at school entry, and indeed most children, will benefit from explicit differentiated

teaching to develop their phonological awareness, print awareness, alphabetic knowledge, emergent writing, and oral language. Particular attention should be paid to developing phonological awareness and the alphabetic principle as these are the primary skills needed to begin to develop decoding. The research suggests that children who struggle with literacy early in school may develop inattentive behaviour such as daydreaming, dawdling, or otherwise disengaging from teaching as they do not possess the skills to develop reading in the way teachers in Aotearoa New Zealanda are typically trained to facilitate learning (Prochnow et al., 2013).

Teachers need to examine their own bias, conscious and unconscious, and their belief structures around expectations and children's achievement to ensure that they have high expectations for all students. This means ensuring that equitable opportunities are given for development of literacy and other academic skills. In addition, teachers can foster students' development of self-efficacy by supporting students' perceptions that they can accomplish a task, providing accurate feedback, avoiding giving meaningless positive feedback, and encouraging students that their ability is not fixed but rather developing, and giving opportunities for further risk taking (Linnenbrink & Pintrich, 2003). Ensuring gains are made in literacy early in school will in itself contribute towards developing self-efficacy. Because self-efficacy develops within specific contexts such as learning literacy skills in school, it is likely that self-efficacy will develop as literacy skills are learnt by students. Experimental studies have shown that self-efficacy can be improved through explicit instruction (Denston, 2016). When students are taught not to attribute their struggle to lack of ability, but rather focus on improving and developing ability and effort in the task, self-efficacy and achievement is improved (Schunk, 1989, 1991). This will increase students' engagement and effort put into reading tasks, and decrease the likelihood of inattentive behaviours developing.

Additionally, teachers need to be aware that students who are sitting quietly or watching the lesson are not necessarily cognitively engaging with what is being taught. Teachers should be aware of students who develop inattentive behaviour, and use this as a cue to identify a potential underlying literacy, or other kind of learning difficulty, that may be leading to a student being unable to engage in the lesson. Checking engagement can be done through observing participation in class discussion, students' discussion with each other, questions asked of teacher and answers given to teacher's questions. This will help teachers identify children who are not cognitively engaged and reengage them in the learning process. This may lead to improved literacy learning and a decrease in developing behavioural difficulties.

Future Research

The first recommendation for further research would be that future studies around self-efficacy and reading development also measure inattention. Inattention has been found to be associated with literacy achievement and, to some extent, the development of self-efficacy. In addition, research should examine the direction and beginning of the relationship between literacy and inattentive behaviour, as research suggests that children who struggle with literacy early in school, or even prior to school, may develop inattentive behaviour as they do not possess the skills to develop reading in the way teachers are typically trained to facilitate learning. The current research is correlation based, thus there is limited ability to draw conclusions around the direction of the relationship and causality. It is theorised that low literacy skills cause the development of inattentive behaviours. However, this needs to be investigated further to be considered conclusive. Further research could also look more closely at what specific inattentive behaviours are associated with literacy difficulties, i.e., distractibility, inability to sustain attention, low persistence, or general processing difficulties.

Further research should investigate how early children develop self-efficacy. There is a strong argument to be made for self-efficacy developing very early on in school years. The current research along with Lee and Jonson-Reid (2016) found self-efficacy to be developed at the end of 1 year of school. It has been suggested that self-perceptions, such as self-concept, develop as early as 6 weeks into school (Chapman & Tunmer, 2003). Self-efficacy has the potential to have long term effects on literacy achievement and inattentive behaviour, as well as achievement across subject domains, such as maths achievement (Jungert et al., 2014). Future research should examine how early self-efficacy begins to develop, and whether interventions at this point can mitigate the potential significant and lasting impact self-efficacy can have on literacy, inattentive behaviours and other achievement over time.

Limitations

One limitation of this study is that correlations did not control for past achievement or decile, however most studies that control for past achievement use regression analysis. It is likely the effect this would have had on outcomes would have been small due to the nature of the analyses and the robustness of the tests conducted. In addition, Bandura (1997) advised against statistical over control by controlling for prior achievement when investigating the association between self-efficacy and achievement, as prior achievement may be influenced by self-efficacy.

The majority of the associations found in this research were weak according to Cohen's (1988) guidelines. However, these findings are similar in strength to the previous findings in the literature suggesting that this is not to be unexpected in this line of research (Liew et al., 2008; Multon et al., 1991; Usher et al., 2019; Wilson & Trainin, 2007).

The self-efficacy measure used in this study had a low Cronbach's alpha, although this can be expected for scales with fewer than five questions. In addition, this low strength result may be in part due to the nature of measuring self-efficacy with young children, as the

reliability and stability of self-efficacy measures tend to increase with age (Davis-Kean & Sandler, 2001; Trzesniewski et al., 2003). Self-efficacy after 1 year of schooling was only weakly correlated with self-efficacy in students' third year of school, suggesting a low test-retest reliability. However, self-efficacy is malleable so a low correlation between self-efficacy at the two timepoints may be expected due to children's actual change in self-efficacy over the course of the study (Denston, 2016). Despite these limitations, the association found between self-efficacy and literacy in this research was of similar strength to findings in previous research (Liew et al., 2008; Multon et al., 1991; Usher et al., 2019; Wilson & Trainin, 2007). Findings should be considered tentative and be followed up with further research. It would be interesting for future research to replicate this study with an alternative self-efficacy measure to investigate whether the association between literacy and self-efficacy is strengthened.

Conclusion

The association between self-efficacy and academic achievement has been a focus of recent research. This study sought to investigate the association between self-efficacy, literacy, and behaviour in school entrants in Aotearoa New Zealand. The study investigated three aspects of the associations between these variables. Firstly, the study sought to discover if there was an association between each of these three variables. Secondly, if correlations were found between any two variables, would any mediation occur when controlling for the third variable. Thirdly, the study sought to find out if self-efficacy level in Year 1 led to differential literacy development over the course of the study.

It was found that inattention was the most highly associated behaviour variable with both literacy and self-efficacy. While inattentive behaviour is less overt than other behaviours, including hyperactivity and moody-uncooperative, it was inattention which is more strongly linked to literacy and self-efficacy. A robust reciprocal relationship was found

between literacy and inattentive behaviours, independent of self-efficacy. A reciprocal relationship between self-efficacy and literacy was also found, independent of inattentive behaviours. A unidirectional association was identified between self-efficacy and inattention, independent of literacy, with self-efficacy in Year 1 being associated with inattention in Year 3. More evidence is needed to confirm the unidirectional relationship between inattention and self-efficacy. It is possible that the developing association between inattention and reading ability subsequently led to the association between self-efficacy and inattention, despite efforts to remove the effect of literacy in analyses.

These findings reveal that self-efficacy is exclusively associated with reading development while reading development is associated with both self-efficacy and inattention. While inattention is associated with literacy, and to a lesser extent self-efficacy, self-efficacy is likely not the primary reason for this triangular association. Inattentive behaviour at the outset of schooling seems to not, in itself, lead to lower self-efficacy, but rather is associated with lower self-efficacy through difficulty developing reading. This suggests that either or both inattention and literacy are the main factor in this correlation triangle. While the analyses were correlational, measures were collected over a 3 year period so there is the ability to draw some indicative suggestions concerning causal relationships which needs to be confirmed by further research. It is suggested that a child struggling with the development of literacy skills is also likely to develop inattentive behaviours and low self-efficacy. Equally, a child with highly inattentive behaviours is likely to struggle to develop literacy and thus subsequently is likely to have lower self-efficacy. In both cases, early detection and mitigation of these factors may reduce the development of further struggles.

The findings did not support the existence of a Matthew effect. Those with low self-efficacy developed literacy abilities at a similar rate to those with high self-efficacy. However, those with low self-efficacy at Year 1 were consistently scoring lower than their

peers with high self-efficacy. While it is encouraging that no Matthew effect was found, focus should be on accelerating the learning of students with low self-efficacy and low literacy achievement to catch up to their peers with high self-efficacy.

The findings have important implications for practice as if inattentive behaviours are identified and remedied early in school, this may help literacy skills develop and support the development of reading self-efficacy. However, it is likely that the association between inattention and emergent literacy skills begins prior to schooling (Sims & Lonigan, 2013). Therefore, attention should be paid to inattentive behaviours and literacy difficulties in preschool as well as early school years. In addition, some children come to school with substantially fewer emergent literacy skills than others (Tunmer et al., 2013), which makes them more at risk of struggling to develop literacy and thus, subsequently developing low self-efficacy and inattentive behaviour. Notably, such risks may be exacerbated if children are taught using whole language focused teaching programs, such as those commonly used in Aotearoa New Zealand. However if low emergent literacy skills are identified and remedied through explicit instruction early in school, reading self-efficacy is likely to rise and the risk of inattentive behaviours developing is likely reduced. Ensuring positive reading development in children throughout their first years at school requires that focus be placed not just on literacy, but on self-efficacy levels and inattentive behaviours, as these have the potential to impact a child's academic outcomes, psychosocial development, and wider societal success.

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